CHAPTER 3

DATA MANAGEMENT

Upon completing this chapter, you should be able to do the following:

- *Explain how to convert, process, transfer, and verify data files.*
- *Describe how to input and manipulate data on a computer system.*
- *Calculate storage and memory requirements for computer systems and data.*
- *Explain how to perform software configurations and how to install and upgrade software.*
- *Review I/O file specifications and determine system I/O requirements.*
- *Explain how to analyze the requirements, review the structure, identify the problems and change the structures of databases.*

Data management incorporates many aspects of data manipulation and inputting, calculating storage and memory requirements, and computer software. You will need to know how to install applications software so it works and be familiar with all types of productivity software. Database management techniques will aid you in understanding how databases are analyzed, how to review and change structures, and how to identify problems.

DATA ADMINISTRATION

Data administration is an ongoing concern of management. Data administration encompasses all the technical and management duties required for converting, processing, transferring, verifying, and inputting data. Over the years, data resources in the Navy have grown in size and complexity. It is apparent that not all of the data problems within the Navy are resolved with the use of software. Some are taken care of with hard work.

DATA MANAGEMENT

Data management programs or routines are concerned with reading and writing data, locating data files, controlling I/O devices, handling I/O errors and requests, and providing space on output media for new files. In short, data management routines oversee the locating, accessing, outputting, and maintenance of data files. Can you imagine yourself trying to keep track of the location of all data files, which disk pack each is on, and which disk pack is mounted on which online disk drive. To try to do this would be overwhelming. Thanks to data management routines, you are relieved of this responsibility.

The converting, transferring, and verifying of data files is left up to the operator to perform. All of these processes are completed by the use of application utility programs. The transferring and verifying of data files is accomplished by using a copy utility. Data file conversion is accomplished by a utility of the software program being used, such as converting a WordPerfect® file into a Microsoft® Word file.

There are several different ways to accomplish the inputting of data into the system. The oldest technique is data entry, keying the data off of source documents straight into the system. The most common ways are inputting the data from a tape or disk file. These files are produced from another job or from another installation, such as status of supply parts.

Once the data is inputted into the computer system, we have the capability of manipulating the data by copying, appending, deleting, and editing it. Copying and appending are used primarily for manipulating

entire data files, while deleting and editing are used for individual records in a data file.

COMPUTER SYSTEM SOFTWARE

Up to now, we have been discussing computer hardware (the computer and its peripheral devices) and the manner in which these devices work and are able to talk (communicate) with each other. But what about this thing called software? Do we really need it? We most certainly do! Software plays a major role in data processing; for without software, we could not direct the computer to perform simple addition. It's the software that makes everything happen. Or, putting it another way, it brings the computer to life. At this point, we briefly describe the general types of software used in computers.

Software can be defined as a set of computer programs, procedures, and associated documentation concerned with the operation of a data processing system. Basically, there are two types of software: systems software and applications software.

SYSTEMS SOFTWARE

Systems software, often referred to as *systems programs,* consists of supervisory and support modules (programs) designed to coordinate the capabilities of the computer itself. These include programs such as operating systems, assemblers, debug routines, text editors, compilers, library maintenance routines, utilities, linkage editors, and I/O drivers.

Operating Systems

An operating system is a collection of many programs used by the computer to manage and control its own resources and operations. These programs control the execution of other programs. They schedule, assign resources, monitor, and control the work of the computer, allowing it to carry out tasks independently of most human intervention.

Assemblers and Compilers

Both assemblers and compilers are language translators. They are usually designed for specific machines and specific languages. They translate computer programs written in assembly language into machine language. A language translator for an assembly language is called an *assembler program.* Most high-level language translators are called *compiler programs.* These translators are designed to convert the artificial languages used by programmers, such as COBOL or FORTRAN, into a machine-usable code after it is entered into the computer.

Utilities

Utilities are programs or routines that have general application. They may be separate programs or they may be routines or programs included with the operating system to further aid the user by performing standard functions. Sort, merge, and copy programs are typical examples. Other examples are text editors to allow programmers to enter, add, delete, or change program statements; linkage editors to put together compiled programs and routines; and debug routines to help programmers find errors.

APPLICATIONS SOFTWARE

Applications software consists of programs designed to solve specific classes or types of problems. For example, word processing programs help us prepare correspondence, instructions, messages, and so on. Spreadsheet programs enable us to store and manipulate numbers in numerical tables. Database programs enable us to store and retrieve large amounts of data in various report formats. Some software is ready to use and may be purchased from retail stores and government contracts. This software is called *off-the-shelf software* (COTS). If COTS is not available to solve Navywide or individual user problems, the Navy may write its own programs. Some programs are designed and written by one of the Navy's central design agencies and distributed to AIS installations for use. If no Navy-developed software will solve an individual problem, you or your automated information system (AIS) installation may write a program in one of the many programming languages.

PROGRAMMING LANGUAGES

Almost any type of application you can think of can be programmed in one or more of the many programming languages. Just as we humans speak in many different languages, computers also speak (use) many different languages. We can divide programming languages into three categories: machine languages, assembly languages, and high-level languages.

Machine Languages

A machine language consists of a combination of 0s and 1s that is used to indicate OFF and ON states of

electricity. All data and instructions are represented (written) in a binary form. This is the ONLY form the computer is able to understand. Each computer has its own machine language; therefore, a program written for one computer type cannot be transferred to another type of computer system. Writing programs in machine language code is time-consuming and requires the programmer to specify each operation code and the specific location for each piece of data and each instruction.

Assembly Languages

We use assembly languages to avoid having to code directly into machine code (0s and 1s). Assembly languages use symbolic codes called *mnemonics* to represent operations. For example, the letter *A* could be used for add, and the letters *ST* could be used for store. Although assembly languages are more user-oriented than machine languages, they are still quite complex to work with as a programmer. Assembly languages are generally used by systems programmers to design and maintain operating systems and other systems software where speed of operation and conserving storage are more important than programmer time.

High-Level Languages

A whole host of high-level programming languages have been developed to solve one particular class of problems or another. High-level languages were developed to allow you, as a programmer, to work in a language that is close to English or mathematical notation, thus improving overall efficiency and simplifying the communications process between you and the computer. These high-level languages allow us to be more concerned with the problems to be solved rather than with the details of computer operation. Examples of high-level languages include COBOL, FORTRAN, BASIC, Pascal, Ada, and C++.

COBOL.— COBOL was developed for business applications. It uses everyday English-like statements and is good for handling large data files. COBOL is the acronym for COmmon Business-Oriented Language.

FORTRAN.— FORTRAN was developed for mathematical and scientific work. It is used by engineers, scientists, statisticians, and others in areas where mathematical operations are most important. FORTRAN is the acronym for FORmula TRANslator.

BASIC.— BASIC was designed as a teaching language to help beginning programmers write programs. Therefore, it is a general-purpose, introductory language that is fairly easy to learn and to use. With the increase in the use of microcomputers, BASIC has regained popularity and is available on most microcomputer systems. BASIC is the acronym for Beginner's All-Purpose Symbolic Instruction Code.

PASCAL.— Pascal is a language designed to teach programming. It is fairly easy to learn; yet it is a more powerful language than BASIC. Although Pascal is not yet a standardized language, it is still used rather extensively on microcomputers. It has greater programming capabilities on small computers than are possible with BASIC. It is used by many colleges and universities. It is named after Blaise Pascal, a mathematician and the inventor of the first mechanical adding machine.

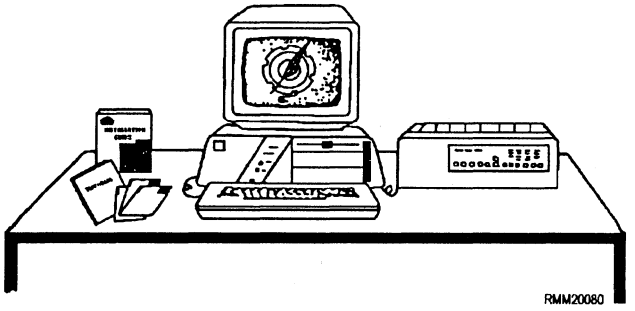
ADA.— Ada is a modern, general-purpose language designed with the professional programmer in mind. It has many unique features to aid in the implementation of large-scale applications and real-time systems. Its development was initiated by the U.S. Department of Defense (DOD). It is named to honor the achievements of Ada Augusta Byron, Countess of Lovelace, who was a supporter of and collaborator with Charles Babbage, the first person to propose the concept of the modern computer. She suggested using the binary system of storage instead of the decimal system and developed the concept of a loop to execute repetitive instructions. Babbage is known as the father of the computer, and Ada Lovelace is considered the first programmer.

C++.— C++ is a general-purpose language that works well with microcomputers. It is useful for writing both operating systems and database programs. The programs are portable, which allows them to be run without change on a variety of computers.

INSTALLING THE SOFTWARE

Depending on the needs of the users, the software will vary from command to command. But one thing is for sure, your system will have a disk operating system to make the whole thing work. Beyond that, you may have users who run only wordprocessing, or only database management applications. Maybe they use graphics and do desktop publishing. Maybe all their applications are accounting, and they rely primarily on spreadsheet programs and specialized accounting type programs. Some may even be writing their own programs in languages such as PASCAL, BASIC, or COBOL. It may be your job to help users install, learn,

and effectively use one or more software packages or programs. It may be your job to develop specialized programs or routines for your installation or for users in their own work spaces. In the following sections, we will discuss installation and use of a few of the general types of software we commonly associate with microcomputers.



Operating System

The operating system will be the first program you will need to know about because you must install it before other programs. It manages the operation of the system.

If the system has a hard (fixed) disk, you will install the operating system onto it. The first step will be to partition the hard disk; that is, identify the hard disk to the operating system and create a partition for the operating system. Partitioning is the process of dividing the hard disk into smaller drives, which will allow you to use different operating systems, such as DOS or UNIX. Next, you will format the hard disk, prepare it so it can be used. The operating system will ask a question similar to, "Are you sure you want to format the hard drive?" before it proceeds with the format. Then, copy the operating system files from the distribution disks onto the disk. You must follow the steps in the owner/user manual. It may tell you to use a setup command that will lead you through the process from the display screen. Once it is installed, everytime you turn on the system, the operating system will load from this partition.

If the system has only floppy disk drives, you will make copies of the distribution disks onto new diskettes. If the new diskettes are not formatted, you can use a command (such as DISKCOPY) that will format and copy. Again, follow the instructions from the startup or getting started section of the owner/user manual. If there is a setup command, use it to lead you through the process. Be sure to prepare external labels with the name of the operating system. Write the serial number if there is one, and write WORKING COPY. Be sure you use a felt tip pen if you are writing on a label already attached to the diskette.

Once you have the operating system copied and installed, put the original distribution disks in a safe place. Now, you are ready to use the computer; or are you? Chances are you will need more than the operating system. The operating system is great. It has many useful commands like COPY, DELETE, FORMAT, BACKUP, and soon. It will even have an editor, usually a line editor, that allows you to create files and edit them line byline. However, its primary jobs are to manage the system and its resources (disks, printers, and soon), and to help you communicate with the computer to use other programs (applications software).

User/Applications Software

When you install a user/application software package on a system, you need to provide the software with information about your microcomputer configuration. Because there are so many different software packages and programs available and each one has different requirements, we will not go into a lot of detail. Remember, refer to the documentation, it should provide what you need to know. Many of the manuals lead you through step-by-step. The following example should give you a good idea of what is involved. We have selected a wordprocessing program for our example because most installations will have a wordprocessing package.

BACK UP DISTRIBUTION (ORIGINAL/ MASTER) DISKETTES.— The first thing you should do is copy the files from the distribution diskettes. Each software package may have several diskettes. If you have a hard drive system, you may copy the files from the distribution diskettes to the hard drive using the copy command in the operating system. First, setup the name of the directory in which you want to store the files. Then, copy them to the hard disk. If your system has no hard drive, copy the files to other diskettes. Most operating systems have a copy command that allows you to copy all files on a diskette with a single command. This is called a wild card copy. The copies will become your working copies. Prepare external labels for the working copies. Store the distribution diskettes in a safe place away from the microcomputer in case you need them in the future.

SET UP/INSTALL THE SOFTWARE.— Place the user manual with installation instructions next to the microcomputer and follow the step-by-step procedures.

Make sure you complete each task successfully before going onto the next.

The first step will probably be to execute the program from a setup disk or in a setup mode. You will probably execute a command that will lead you through a series of prompts and menus on the display screen. This will allow you to tell the program about your system and make initial settings. These settings will define your system and set the defaults. This means that everytime you execute the program, the settings will be what you specified. You will not have to reset them each time. For example, you might be asked whether you want the software to automatically backup your data. If you enter yes(y), it will ask you how often, every so many minutes. You enter the number. It may give you a choice of whether you want a beeper set to alert you to a given condition. For example, the system can be told to beep when certain error conditions occur. If the software is a wordprocessing program, you will want to specify the margin settings you normally want; for example, left margin at position 10 and right margin at position 75. You might want to tell it to automatically right justify print and to format date as mm/dd/yy. You can tell it whether the default setting for paper type should be continuous-form or single sheet; and so on. Once you have established the defaults, you will not have to change them unless you want something different.

You may also need to tell the software what type of printer you will be using. This will enable the program to send the proper signals to your particular printer. You may be able to define several printers and select the appropriate one when you use the software. Some software packages come with definitions for many printers, and it is a simple matter to tell it which you have by selecting the make and model number from a menu.

Occasionally, you will need to upgrade the software that you have loaded onto the computer. To do this, you will follow the same procedures that you did when the software was originally loaded. That is, read and follow the instructions included with the upgrade. Virus software is upgraded most frequently, with the discovery of new viruses that are out there.

WORKING WITH USERS

End users, especially first time users and noncomputer users, will need your help to operate their systems and their programs. They also need to know how to care for and handle diskettes, manage disks and files, take care of the system, and perform user/operator maintenance. Don't be surprised when you get your first call for help. As you have learned, computers seem to have minds of their own and can do strange things. Help users by troubleshooting and identifying problems. Teach them what you know.

Using Software

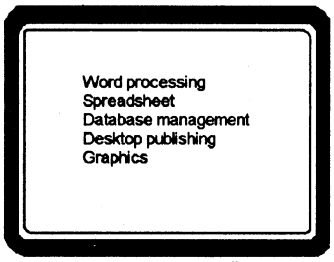
Once you have the software installed and set up so it works on your system, the system is ready for use. Simple enough, you say—so what should I do first? You should boot either from the hard drive or by inserting the diskette that contains the operating system. You can set up the system so it will automatically boot when power is turned onto the system. Next, tell the operating system which program to use. Do this by entering the file name of the program following a prompt given by the operating system. For example, if the program is named WPP (for wordprocessing program), enter WPP and press the ENTER (RETURN) key. If you are using a hard disk, be sure to specify the directory used when you installed and set up the program. The operating system will then load the program into memory and the system is ready to do the work. From this point on, follow the instructions of the software package; in this example, a wordprocessing program. Refer to the user manual and any in-house user manuals that apply.

When you have finished your processing, return to the operating system before turning off the power. Do this by saving your work and exiting the program properly. Each program will have a procedure or command to end execution of the program and return to the operating system. If using diskettes, remove them from the drives, put them in protective jackets, and file them in an appropriate place. If using a hard disk drive, it is considered good practice to enter the operating system command to park the read/write heads. This will move the heads away from data storage areas so data will not be destroyed if the system is moved or accidentally bumped. Then turn the power OFF.

WORKING WITH SOFTWARE PACKAGES

When you work with packaged software, you will be concerned with what it does, how it does it, and how you are to interact with it. For each different type of application package, you will be confronted with anew vocabulary. For example, the terms used with word processing come primarily from the office/clerical

environment (margins, tab sets, indenting, paragraphs, and so on). The terms used with desktop publishing come from the printing industry (fonts, type styles, points, and soon). Spreadsheets bring us the vocabulary of an accountant or bookkeeper (worksheets, rows, columns, data cells). Database terminology may look the most familiar to you, because many of the terms come from data processing (files, records, fields, keys, and indexes). First, we will look at the commonalities, then at the specifics of several different types of software packages—word processing, spreadsheet, database, desktop publishing, and utilities.



USING SOFTWARE PACKAGES

Regardless of the type of software package you are using on your computer, at a minimum, you will need to know how to conduct the following seven general operations:

- **Access** and **execute** the packaged software from the operating system.
- **Create** a new file or **retrieve** a previously created file on disk/diskette or tape.
- **Save** a file onto disk/diskette or tape.
- **Delete** a file stored on disk/diskette or tape.
- **Print** a file.
- Indicate to the packaged software that you want to **stop** working on what you are currently doing to do something on another file.
- **Terminate** your work via the packaged software and return to the operating system.

NOTE: Each software package will have specific ways you are to perform these functions.

A major consideration for a person working with packaged software is **file management.** You will need to know how files are setup, coded, named, backed up, and accessed. You will need to know who can access the files, whether you can control access by others, whether you can protect the data, and whether the data is encrypted.

Learning About Software

The first thing you will learn is there is a lot to learn. You will need to know what functions you can perform, what keys activate what functions, and how to save the work/files you create. If a tutorial or learning section comes with the software, start with it. It will give you an overview. Then begin by experimenting and practicing on something you cannot hurt or destroy. Don't start with the master copy of a large database file. Instead, create a few records in a test file and practice on it. Try out each function, then try the functions in combination with other functions. Even make mistakes on purpose to see what happens. Did the software give you an error message? Can you recover? Does the software provide an undelete feature that lets you cancel what you just did? How much protection from error is built into the software? Does it give you a message such as: Do you really want to delete this file? Or, does it just assume when you hit the delete key you mean to? Most of the better software packages have built-in safeguards to protect us from ourselves. Recovery from operator/user error is a very important feature of many software packages.

Interacting with Software Packages

Basically there are only a few ways to tell software what to do. They are as follows:

- **Direct commands—** You enter words/ characters via the keyboard to tell the software what to do. These words and/or characters are predefined by the software to perform specific tasks.
- **Menus—** You select the function or command you want performed from a list presented on the display screen by the software.
- **Function keys—** You select the function key (F1, F2, and so on) that is predefine to tell the software what you want it to do. This enables you to perform some of the more common commands without going through menus and with fewer keystrokes than required for direct commands.

- **Programs/macros—** You execute routines (a series of instructions/keystrokes) that have been developed and stored previously.

Which of these methods you will use depends on the design of the software; not all software includes all methods. Some software gives you a choice, and you can select the method you prefer. When learning, it is usually easier to use a menu because all the choices are presented. Once you have learned the software, you may prefer direct commands because you do not have to work your way through a series of menus to find the function or command you want. Programs/macros are most useful for repetitive tasks. They enable you to enter the sequence of keystrokes (steps) or characters you want to repeat. Once entered and stored, you can execute the entire sequence with one or two keystrokes—a real time saver.

Becoming a Proficient User

You will also learn that software does not do everything you want in the way you would like. The more you work with a package, the more you will be able to find ways around what you consider deficiencies. You will also learn you can compensate for these problems by writing and saving your own routines, programs, or macros to perform some of the more complex or awkward functions. Some packages enable you to define your own function keys, change the function of a key, or store routines as macro instructions. These are all desirable features for the more sophisticated users. This also means routines can be developed by experienced, proficient users for use by other users.

Do not hesitate to learn from others and do not limit your study. Ask others how they are using a package. What tricks have they learned and found useful? What routines/macros have they designed to perform recurring functions? Build on their knowledge and share yours. You might even institute a users group. It need not be formally organized-maybe during the noon time meal once a month.

Let's take a more in-depth look at some of the more commonly used software packages—word processing, spreadsheet, database management, and desktop publishing software.

WORD PROCESSING PACKAGES

Word processing packages are readily available for use in office environments on microcomputers. They enable you to create, modify (insert, delete, rearrnge), save, copy, and print documents (see figure 3-1). The usual method of entering a document is to type it on a keyboard. Another method is to use a scanner to read a printed document and encode it into a digital file for computer processing. You might also receive a document that has been transmitted over a network or phone system.

Creating and Modifying Documents

To create a new document, you will start by telling the system you want to create a document. In some packages this is the default option—the option you get if you do not specify something else. When you load and execute the program, you are in the create mode and simply start typing. The software will probably have a number of defaults that can be set up for your installation. For example, you can probably have defaults set to 8 1/2-inch by 11-inch paper, with a 1 1/2-inch margin at the top, a 1-inch margin at the bottom, and 1/2-inch margins left and right. You may be able to have tabs set as a default option for indenting paragraphs.

Regardless of how the original document is entered, eventually, it ends up as a data file on some type of secondary storage media that you can later access and modify (add, change, or delete). To make changes, you

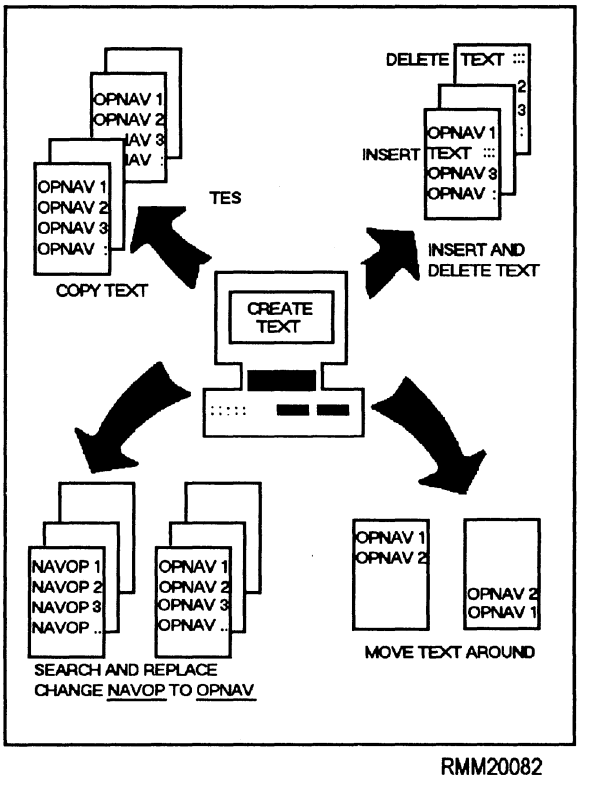


Figure 3-1.—Examples of word processing program features.

must retrieve the file into the computer's memory. The software displays the document on the screen. You then make entries by moving the cursor to the places in the document where you want to make changes. Two modes of operation are used—typeover and insert. As the words imply, if you are in typeover mode, you will replace what is presently there. If you are in insert mode, the material to the right of the cursor will move to the right as you enter new material. These, along with other features, are shown in figure 3-2. Take a few minutes to study the figure.

The basic features you will use are as follows:

- **Cursor movement keys—** Move the cursor up, down, right, left, to top/bottom of document, to next/previous page/screen; search to find a character string or function code in the document.
- **Insert mode—** To add letters/characters, words, sentences, and so on.

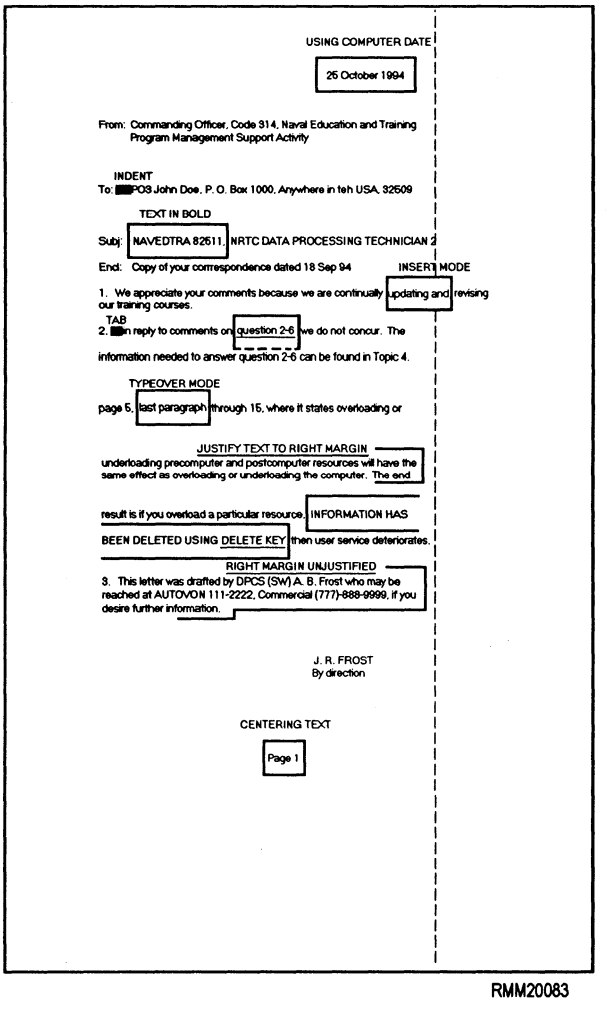


Figure 3-2.—Examples of basic features found in word processing packages.

- **Delete key—** To take out unwanted characters, words, sentences, and so on.
- **Backspace key—** To erase words to the left of the cursor one character at a time. (NOTE: In some packages this key may be defined differently. For example, it may backspace without deleting.)
- **Typeover mode—** To replace text by typing over it.
- **Wordwrap—** As you enter text, words automatically move to the next line when the right margin is reached. You do not have to press the return key at the end of each line as you do on a typewriter.
- **Cut and paste function—** Allows you to move material from one place in a document to another.
- **Function keys—** To underline, center, tab, indent; put text in bold; use subscripts/ superscripts. You can put text in columns; add headers, footers, footnotes, page numbers, date, and so on.

Special Features

Many word processing programs include **dictionaries** and a **thesaurus.** These enable you to check for correct spelling and to look for synonyms. Some of the dictionary routines even provide a list of correctly spelled words you might have meant. In this case, you can correct a mispelled (or is it misspelled) word by selecting the correctly spelled word from the list on the display screen. The same is true of the thesaurus, the software lists synonyms on the screen. You select the one you want, and it replaces the original word with the selected synonym.

Some word processing programs have automatic **paragraph numbering** and **outlining** features. Once you have created the outline or document, you can delete or add entries, and the software will automatically renumber/reletter the outline or paragraphs in the document.

Some word processing programs have **indexing** capabilities. You can tell the software which words/terms are to be included in an index. The software will then automatically create the index in alphabetical order, with the appropriate page numbers.

Some enable you to create a **table of contents** or **other types of lists.**

Some word processing programs even include some of the features of a **spreadsheet package.** While they may not be as easy to use or as sophisticated, you can define **columns** and **rows** and perform some **arithmetic functions.** For example, you could total a column or calculate total cost of an order by having the software multiply the number of items by unit cost, and put the result in another column.

Some word processing programs enable you to set up **records** with defined **fields.** For example, you could set up a file of records with names and addresses. Let's say your organization sends a memo each month to the same list of organizations. Using a feature of the word processing program, you could create one letter and have the names and addresses inserted in (merged with) the letter automatically in the proper places. This is the same feature the sweepstakes companies use to insert your name throughout their letters to you to personalize them. This is sometimes called the mail merge function. It is unlike the merge function we think of in data processing in which the records in two or more like files are sorted in the same sequence by keys and then merged together into a single file. In mail merge, the variable information (name, address, and so on) is inserted in predefined places in a document and the document is printed.

Some word processing programs include many of the features of **desktop publishing.** You can view a finished document on the screen as it will appear on paper—WYSIWYG (what you see is what you get). You can scan art and insert it in the document. You can use a variety of type styles and sizes (fonts) if your printer can handle them.

Capabilities are continually being added and combined. You might have several electronic office tools all rolled up into one package—word processing with mail merge, database with report capability, spreadsheet with charting capability, and a communications package. How is that for an integrated software package! You will be able to use each tool as a separate entity, or you can integrate them together to produce sophisticated reports by combining text, graphics, and images in relatively complex multicolumn layouts. These packages will also include a graphical user interface (GUI) or lists of options (menus) presented on the screen, rather than having you memorize numerous computer commands to get the personal computer (PC) to do what you want.

SPREADSHEET PACKAGES

Simply defined, a spreadsheet electronically duplicates an accountant's or bookkeeper's tools, which normally consist of a ledger pad, a pencil (with an eraser), and a calculator. When using spreadsheet software, you enter and change data (figures of various types) by typing on a keyboard rather than writing with a pencil. You are able to view your figures on the computer's monitor rather than having to read a ledger pad. The data is presented as it would appear on paper, in rows and columns. Figure 3-3 is an example. Many everyday tasks can be managed with spreadsheet software. The computer can perform a variety of mathematical calculations—from simple addition, subtraction, multiplication, and division to trigonometry, and statistical and business calculations.

Understanding Spreadsheets

Before you can understand how a spreadsheet program works, you must first have an understanding of what the terms **record, column,** and **data cell** mean.

- **Record—** A record is represented by a line (row) of data items of information on a spreadsheet. This is the horizontal component of a spreadsheet. Normally, a record contains information about one particular item or topic, for example, a person or a piece of equipment. Spreadsheet rows are usually identified by numbers (1, 2, 3, and so on).

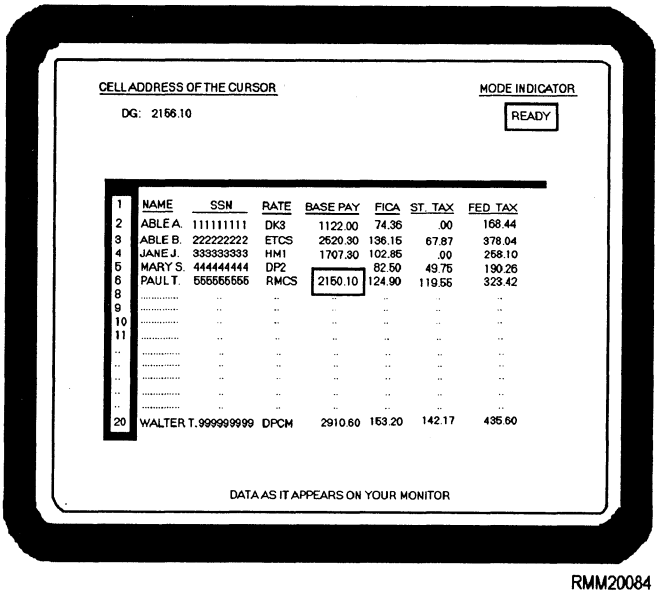


Figure 3-3.—Example of a spreadsheet/worksheet.

- **Column—** A column is the vertical component of a spreadsheet. A record (or row) can have many associated columns, such as base pay, FICA, state tax, federal tax, and so on. Each column contains one type of information and is normally labeled to identify the type it contains, such as base pay. The columns are usually identified by letters (A, B, C, D, and so on).

- **Data cell—** A data cell contains one piece of information associated with a particular record. Thus, a record/row that contains seven pieces of information will have—you guessed it—seven data cells. A data cell is symbolically identified by using some type of common notation-usually column, row. Therefore, if you have a spreadsheet with 20 records, each with 7 columns of information, the rows will be numbered from 1 through 20, and the 7 columns will be identified by the letters A through G. In this way, the fourth column, sixth row of the spreadsheet will be data cell D6, which, in figure 3-3, contains the value 2156.10.

The entire collection of data cells is often referred to as a **matrix** or an **array.** When entering data, it is not necessary to enter it in alphabetical or numerical order; the software package will normally arrange the data in whatever sequence you desire.

In looking at figure 3-3, you will notice each individual has only one record, and each record/row contains seven columns (or data cells) of information. There could have just as easily been 20, 50, or 75 columns of information per record. The number of data cells is limited only by the parameters of the spreadsheet software and by the amount of available RAM. To give you some idea of a spreadsheet's size, the worksheet you see in figure 3-3 might be only a small portion of the entire worksheet—the amount that can be displayed at one time. Although there appear to be only 20 rows and 7 columns of information, depending upon the software package you are using, it could conceivably contain up to as many as 8,192 rows and 256 columns of information totaling more than 2 million data cells. A spreadsheet of this size would be equivalent to a piece of paper approximately 21 feet wide by 130 feet long. Try spreading that out on a table!

Interacting with Spreadsheet Software

Like other software packages, you have cursor movement keys, function keys, and commands to tell the software what to do. The following list contains some of the more common ways you can expect to interact with a spreadsheet software package:

- **Cursor movement** (or arrow) keys— You can move the cursor one cell at a time in one of four directions—up, down, left, or right. Other keys such as PgUp and PgDn move the cursor up or down one full page; still others, when used in conjunction with other keys, move the entire worksheet in a specific direction.

- **Function keys—** You can use F1, F2, F3, and so on, to display HELP screens, edit entries, display range names, enter absolute formulas, move back and forth between screens or windows, perform range and global recalculations, and so on.

- **Spreadsheet commands—** You can use commands to tell the software what to do.

Features of Spreadsheet Software

Spreadsheet software packages normally include ways to do the following things:

- **Enter** labels (non-numeric data).

- **Enter** values (numeric data).

- **Enter** formulas (to perform calculations, analyses, comparisons, and projections).

- **Insert** and **delete** columns and rows.

- **Copy** and **move** ranges of data cells/records from one area of a worksheet to another.

- **Erase** part or all of a worksheet.

- **Change** the way values are represented on part or all of a worksheet.

- **Split** the viewing screen to allow you to view two parts of a worksheet simultaneously.

- **Save, retrieve, rename, erase,** and **copy** files.

- **Print** a worksheet.

Figure 3-4 is an example of a printed spreadsheet showing the labels and titles, along with the values you entered (shown in italics), and the values calculated by the computer (shown in bold). Notice all the totals and subtotals were calculated by the computer. By using spreadsheet software, you need only enter a new price

MAGENTIC MEDIA REQUIREMENTS
SPREADSHEET

Item	Number to Be Replaced	Number for Expansion	Total Needed	Cost per Item	Total Cost
Tapes	15	30	45	27.50	1237.50
Disks	4	5	9	350.00	3150.00
Diskettes					
3 1/2 -	10	30	40	1.75	70.00
5 1/4-	10	50	60	1.30	78.00
Subtotal	20	80	100		148.00
Total	39	115	154		4535.50

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Figure 3-4.—Examp1e of a printed spreadsheet.

when the price changes and direct the computer to recalculate the totals/subtotals.

Many of the available spreadsheet software packages will interact directly with other programs such as database and word processing applications. Some spreadsheet packages integrate (or combine) several programs into one, such as a spreadsheet program, a graphics program, and a database management program.

DATABASE PACKAGES

Before we get too involved in database packages, let us first define what a database is. The term *database* conjures up different images for different people. However, the concept is about as nontechnical and easy to envision as a filing cabinet full of file folders. The filing cabinet and its contents are the database. The ability to retrieve the data and calculate statistics quickly and easily without regard to which folder or drawer contains the information makes the database system much more powerful than a comparable filing cabinet system.

Let's consider a simple database, one which contains information about all enlisted personnel at your command in paygrades El through E6, including their NECs. First, you must establish a record in the database for each individual. Conceptually, you can think of it as a file folder containing information on one particular individual. You have one file folder, or record, for each individual in your database. In this case, we want to know the individual's name, rate, social security number (SSN), division, and any NECs the individual currently holds.

Once you have defined the record, you then proceed to establish fields for each of the data elements. In this example the fields are name, rate, SSN, division, and NECs. If you assume each individual can have a maximum of four NECs, you would have a database containing eight fields, as shown in figure 3-5. You now proceed to create the database by establishing the fields, specifying their size and the type of information (numeric, alphanumeric, or logical) they can contain. Then, you enter the information for each individual into the appropriate fields. Once it is created, you can arrange the database in some logical order (by NAME, SSN, and so on). The database is normally stored on some type of secondary storage medium (usually disk), where the information is simply held until you need it.

Now, suppose you wanted a list of the E-5 and E-6 Storekeepers in the supply department with an NEC of 1234. Under a manual system, you would have to open and search through each individual's file folder-there could be hundreds! You would look at various entries; first, for rate (or the rate field in your database file); then, in order to see if this person is assigned to the supply department (the division field). You would then check to see if this person has an NEC of 1234 (the four NEC fields). Finally, you would have a stack of folders for all E-5 and E-6 Storekeepers who are assigned to the supply department and who have an NEC of 1234. You could then list the names from the file folders (the records) selected.

Depending upon the number of folders you have to look through, the entire evolution could take hours to complete. On the other hand, you could use one of the many database packages available to obtain the same answer. The database application program, by knowing the fields in each record and the content of each field, can easily search for this information in a matter of seconds. You simply specify the selection criteria and the report format; the software does the rest—searches

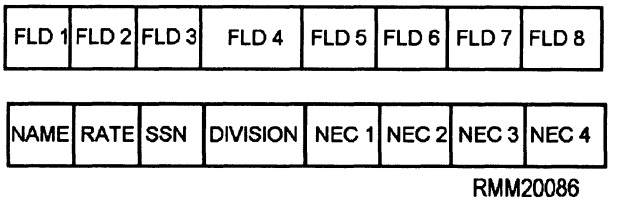


Figure 3-5.—Example of a database record.

the database for the records that meet the criteria (SKI or SK2, Supply Department, and NEC 1234). The computer then displays or prints the requested information in the format specified. See figure 3-6. You do this through the **query** and **report features** of the database package. Doesn't that beat manually searching through a drawer full of folders, which could take hours?

A database is nothing more than a collection of data—many file folders or individual records containing several fields or data elements. The database is organized to allow you to retrieve, update, and have ready access to various information that can be formatted and printed as you desire. The database itself doesn't do anything; it just holds information.

Understanding Database Software

To understand how a database program works, you first need to have an understanding of certain terms. Some of the terms you are already familiar with, whereas others you may not be. These include **database, record, field, pointer, index, primary key,** and **secondary key.** They are defined as follows:

- **Database—** A database holds information that is related to a specific type of application-payroll, personnel, supply inventory, and so on. In this context, the term *database* is often considered synonymous with file. This is especially true when dealing with database files.

- **Record—** A record consists of a group of related fields, all pertaining to the same subject: a person, a thing, or an event.

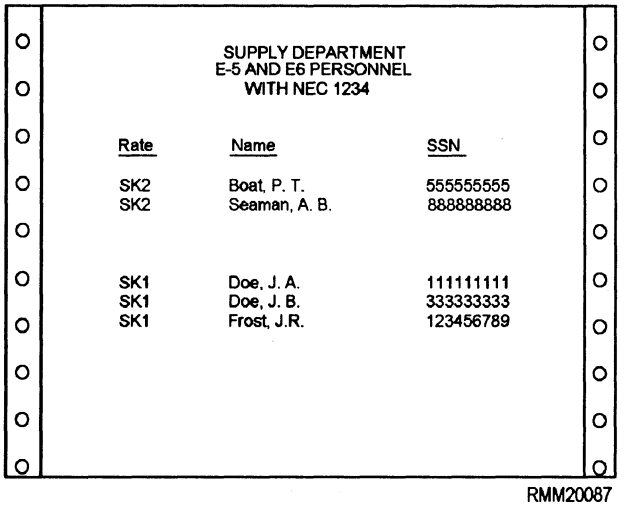


Figure 3-6.—Example of a database report.

- **Field—** A field consists of one unit of information. A field is also referred to as a data item or a data element. It maybe alphabetic, like your name (John or Jane Doe); numeric, like your ZIP Code (01234); alphanumeric, like your post office box or street address (P. O. Box 669 or 1234 Main St.); or logical (true/false), like on leave (true-on leave, false-not on leave).

- **Pointer—** A pointer is a data item in one record that identifies the storage location of another logically related record.

- **Index—** An index enables you to access records in a database (also referred to as database file or file) in the order of the index regardless of the physical sequence of the records in the database. You can think of indexing as sorting without having to sort. The index itself is a file. It contains a duplicate of the key field (or fields) such as account number, or name and security number, and a pointer to the actual disk record identified with this key in another permanent disk file. For example, if there are 5,000 records in your database, and the key field happens to be SSN, then the index would also contain 5,000 entries with each entry having an SSN. It is also possible for you to have one or more secondary indexes that contain other various secondary key fields.

- **Primary key—** The primary key in a database consists of a unique identifier for a particular record and should only point to a single record in the database being indexed.

- **Secondary key—** Data are normally arranged within a database in some type of order, depending upon the contents of one or more fields. Secondary keys allow you to access the database in different ways. For example, your database might be arranged in the order the records were entered. You can then set up a secondary index (or key) by the name field, or by the social security number field. You may specify any number of secondary keys. You might index by more than one field. For example, you could index by last name within rate, as shown in figure 3-6.

Database Organization Methods/Structures

Databases can be **list, hierarchical, network,** or **relational** in structure. The major advantage of a

database is it permits the maintenance of a related set of files or tables that can provide information to several different users. So how do these database structures differ? you might ask. That's a good question. Read on and find out.

LIST DATABASES.— List databases link records together through the use of pointers. The pointer is a data element in one record (normally the master record) that points to the actual disk location of another logically related record, as illustrated in figure 3-7.

HIERARCHICAL DATABASES.— Hierarchical databases consist of elements that act in a superior-subordinate or parent-child relationship. What this means is that one element is linked to another element in the database. The **superior** element points to one or more **subordinate** elements. There can also be a subordinate of a subordinate, which will enable many hundreds of elements to be connected. See figure 3-8.

NETWORK DATABASES.— Network databases are very similar to hierarchical databases except that an element can have **one** or **more superiors.** Network structure permits the connection of the nodes multidirectionally. Each node may have several owners (or elements) and may own any number of other data elements on the network (see figure 3-9). The database management software permits the extraction of needed information from such a structure to begin with any record in the file. Although network databases are more flexible than hierarchical databases, they still have limitations. The networking scheme must be defined when the database is initially created, and information retrieval is based solely on the predefined scheme.

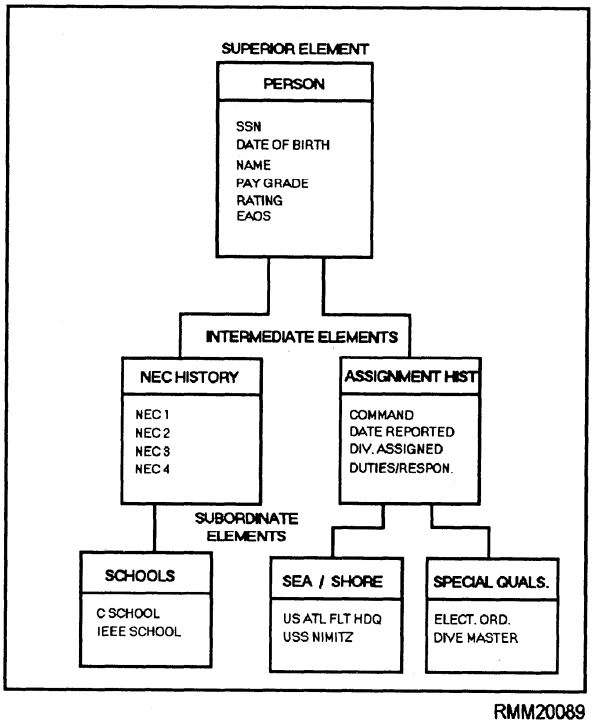


Figure 3-8.—Example of a hierarchical database structure.

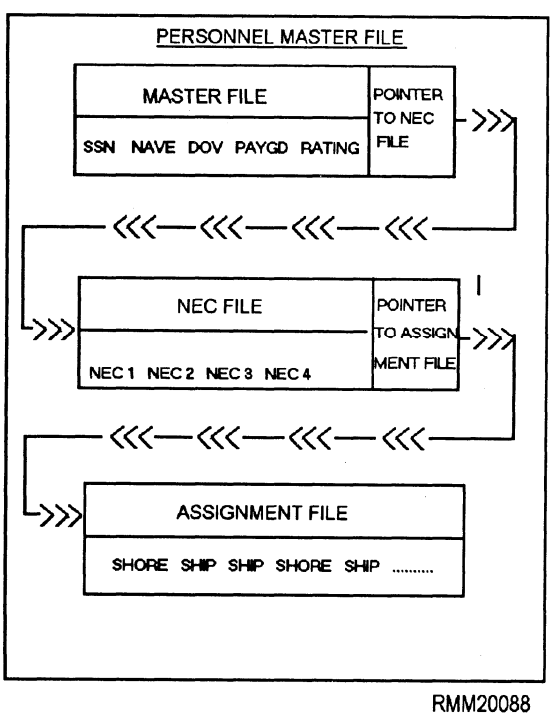


Figure 3-7.—Example of a list database structure.

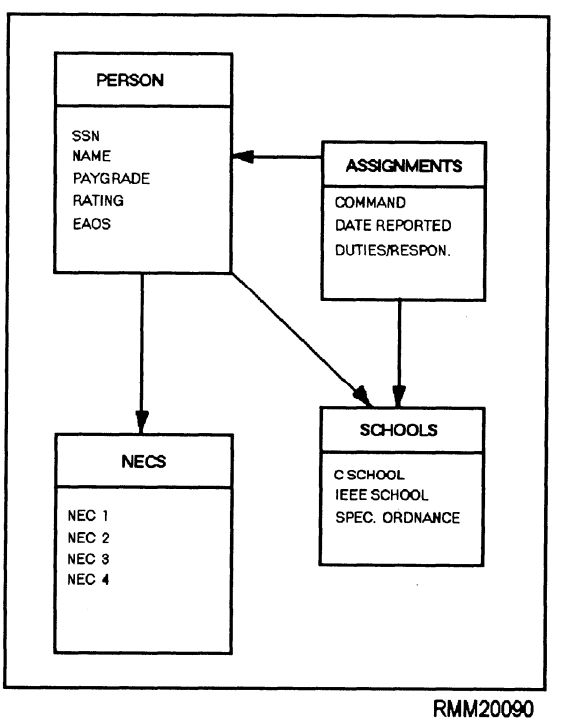


Figure 3-9.—Example of a network database structure.

RELATIONAL DATABASES.— Relational databases have many advantages over network and hierarchical databases. They consist of **one** or **more tables** in which data are stored in the form of **rows** and **columns.** The main advantage is that relationships between the data can be established whenever you (the user) request information. For example, relation tables could be used to link a person with his/her NECs, duty assignments, and any special qualifications, as shown in figure 3-10. Many other relations are, of course, possible. Any relational database package **normally uses an index** of some sort for faster access to the data. Relational structures are a very popular database structuring approach for both mainframe and microcomputer database packages.

Using Database Software

Some of the more common operations you can expect to perform when using a database software package are as follows:

- **Create** databases.
- **Insert, update,** and **delete** data in a database.
- **Create** and **run** forms and reports, **design** and print labels.
- **Query** the database for information.
- **Create** and **run/execute** applications programs.
- **Import** and **export** files.

You can use function keys F1, F2, and so on, to provide help screens, to display lists of items, to design database files, queries, reports, forms, and labels; to add fields to a layout, to move or copy selected data, to enlarge/shrink fields or condition boxes, to print a quick report, to access menus for the current screen, to access macros, and so on.

Some database packages provide you with some type of control screen like the one shown in figure 3-11. Using a control screen allows you to access a number of features. This particular control screen has six panels, each corresponding to a different type of operation on your database. Displayed across the top left-hand corner of the control screen you see three main menus— **Catalog, Tools,** and **Exit. Catalog** provides you with options for managing catalogs and the files contained in them. A catalog is a file in itself that contains the names of related files. **Tools** provide you with a variety of utilities for accessing the disk operating system (DOS), for importing and exporting files, and for setting program parameters. **Exit** enables you to leave the control screen and go back to the disk operating system.

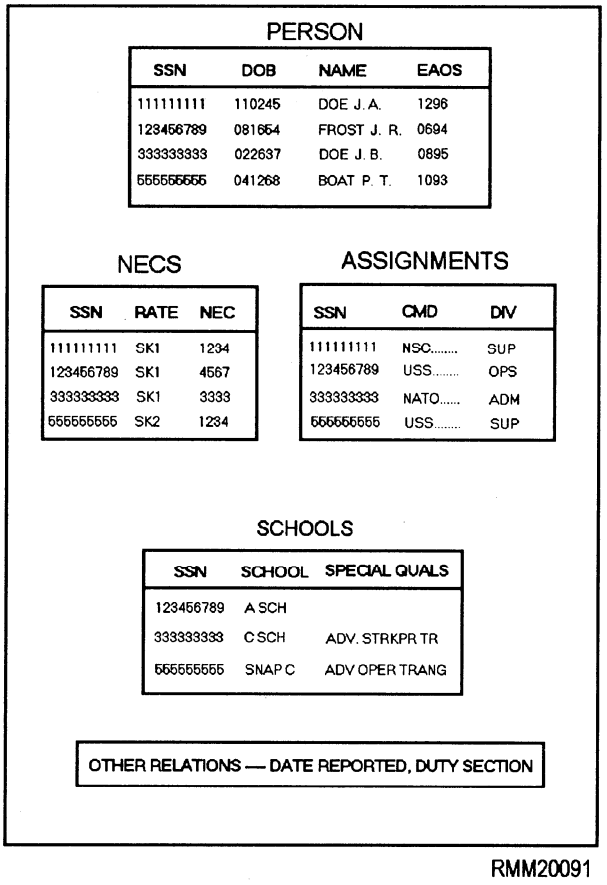


Figure 3-10.—Example of a relational database structure.

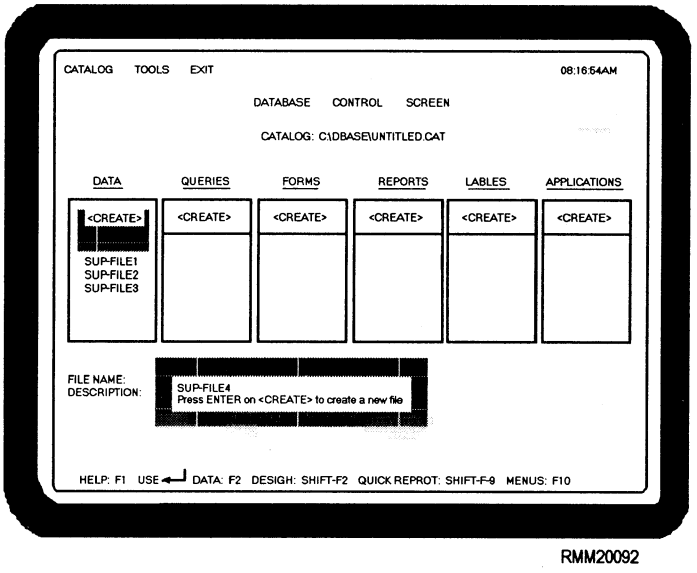
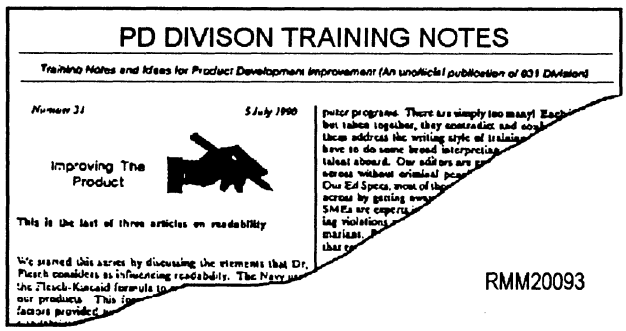


Figure 3-11.—Typical control screen used with database applications.

Most database packages provide you with some type of **query language** that allows you to query a database to obtain answers about the contents of the database, insert new data, update information in various tables, and create views. By using various commands and control statements, you can perform arithmetic, logical, and comparison operations on the data you have selected.

DESKTOP PUBLISHING PACKAGES

Desktop publishing (DTP) packages are used primarily for designing and publishing professional looking documents. They offer you a wide variety of publishing applications. Typical applications include newsletters, advertisements, letterheads, reports, presentations, catalogs, books (such as this TRAMAN), brochures, or flyers, forms, business cards, contracts, magazines, and overhead displays. Again, you will see and hear new terms when you begin working with desktop publishing software. These terms come primarily from the printing/publishing industry.


PD DIVISON TRAINING NOTES

Training Notes and Ideas for Product Development Improvement (An unofficial publication of 631 Division)

Number 31 5 July 1990

Improving The Product

This is the last of three articles on readability

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The features of desktop publishing can be categorized as **composition, layout,** and **graphics.** Let's take a look at each area.

Desktop Publishing Composition

Composition includes defining the sizes and styles of type to be used, the amount of space to allow between horizontal letters and vertical lines, and coding the text (copy) to meet these standards and definitions.

You can enter and edit text directly or you can input text created using a word processing program. Documents created in word processing programs can be **imported** into the DTP software. Once they are imported, you can manipulate the text (copy) any way you want to satisfy your particular publication needs. The following are features and terms you need to become familiar with:

- **Type styles and sizes—** Type is classified according to its style of letter and size. You can choose a variety of type styles (typefaces) and sizes to create impressive forms, letterheads, brochures, flyers, and so on. Examples of Courier and Roman-WP are shown in Table 3-1. Notice each is in a different size. Printers' measurements are based on the point system. The point is approximately 1/72 of an inch. When you hear someone say 8-point type, that simply means that the body of the type measures 1/9 of an inch from top to bottom; 12-point type measures 1/16 of an inch, and so on. The typeface itself is seldom as large as the body, because a small shoulder or ledge is left below the letter on most type. Type sizes range from 3- to 120-point. You will also see the term *font* used in connection with desktop publishing and word processing. A font is a collection of characters of unified design—the typeface and point size are needed to specify a font. However, the term *font* is often used interchangeably with typeface.

Table 3-1.—Table of Type Styles in Several Fonts

Courier, 8 point

Courier 10 Roman, 10 point

Courier Italic, 12 point

Roman-WP, 18 point

Roman-WP Bold Italic, 24 point

Roman-WP Bold, 36 point

- **Letterspacing and leading—** You can adjust space both horizontally and vertically. Letterspacing refers to the addition of small spaces between l|e|t|t|e|r|s within a word. Leading refers to the space added between lines of material.

You can create an index or table of contents by marking special words for an index or use headings and sideheadings to make a table of contents.

Desktop Publishing Layout

Layout involves arranging the text and graphics on the page. The text may flow from column to column on multicolumn documents like the newspaper. You may have to move text from one part of a document to another using the electronic pasting features. You can incorporate illustrations on a page with text. Borders may be drawn around text or illustrations. Illustrations may be sized (made smaller or larger), and additional letter spacing and leading may be added to create a full page. To lay out a pleasing document requires experience and practice as well as a good eye for balance. You will find the following features in most desktop publishing packages:

- **Lay out pages and edit page layouts—** You can lay out pages electronically, rather than having to cut and paste using scissors and glue.
- **Incorporate text and graphics—** Your text and graphics can be electronically merged together in the layout.
- **Multiple columns, column widths, and heights—** The software automatically formats multiple columns on continued pages. You specify how many columns are to be on a page and the amount of gutter space desired. Gutter space is the amount of space between columns.
- **Vertical/horizontal printing—** Material can be printed either vertically or horizontally on a sheet of paper.
- **Fit copy to page—** You can fit the copy to a page either by reducing the type size, increasing or decreasing borders or margins, and any other number of creative ways you can come up with-changing the size of an illustration, cutting off (cropping) an illustration, or even rewording some of the text.
- **Automatic page numbering—** You can have the software automatically number the pages.
- **Headers and footers—** You can also have appropriate headers (titles) at the top of every page and footers at the bottom of every page. Headers or footers can usually include page numbers.

Desktop Publishing Graphics

Desktop publishing packages have the capability to scan or import illustrations/graphics either from hardcopy or from digital data. The following are graphics features you can expect to find in DTP packages:

- **Graphic images—** You can add images, borders, lines, arrows, and so on, of various sizes to the text.
- **Shrink/expand and edit images—** You can reduce or enlarge images to fit in a desired space. If necessary, the images can be altered or edited.
- **Accept images from scanners or other draw programs—** You can import images from a scanner or digitizer. These images can be in either text or graphic form. Images can also be imported from either a paint or draw-type graphics package.
- **Layered output for color printing—** You can create camera-ready copy for color separation work when an outside printing process is required. Color work is done by creating up to as many as four film negatives (one for each of the primary colors—red, yellow, and blue) plus black. Each negative is used to create a separate printing plate for each color. Then, as the colors are overprinted, the color of the original photograph is reproduced.

Hardware Requirements

Unlike the software packages previously discussed, desktop publishing packages (and graphics software packages) require a considerable amount of resources. To give you a better idea of what we are talking about, the following are hardware requirements:

- Microprocessor—At a minimum, you will need a 486 sixteen-bit microprocessor or equivalent. A Pentium or 586 (or equivalent) is even better.

Do not plan on using PCs based on 286 and 386 microprocessors. These machines simply do not have enough computing power to handle DTP chores efflciently.

- **Monitor—** You will need a high-resolution 19-inch monitor. When doing desktop publishing and design work, laying out pages on most standard 12-inch and 13-inch screens can be tiring and difficult. The monitor and associated graphics card should be at the IBM-standard video-graphics array (VGA) level or better.

- **Secondary storage—** Large hard disks are essential for DTP work. Desktop publishing files tend to get very large, and you will soon accumulate many active files on the computer's hard disk. A minimum of 500 megabytes of hard disk capacity is recommended. Hard drives with 850 megabytes to 2 gigabytes are even better.

- **Mouse or trackball—** You will also need a mouse or trackball pointing device to move the cursor position on the monitor screen.

- **Printer—** Although the dot matrix printer is inexpensive and capable of printing graphics and letter quality text, it is insufficient for many DTP applications. A laser printer is the better choice when it comes to preparing quality text and graphics.

- **Scanner—** With desktop publishing systems, you will naturally want a desktop scanner to capture photographs, art work, clippings, and other forms of art work.

More and more DTP functions are being added to word processing packages. For some applications, this will eliminate the need for separate DTP packages. However, you will still need a scanner, a mouse, and a compatible laser printer.

UTILITIES

Software utilities further enhance your computer's capabilities and make it run more efficiently, whether it be a mainframe, mini, or micro. Once a computer user like yourself becomes familiar with the system and applications software you are working with, you want the system to do more and do it faster and more efficiently. Utilities can satisfy some of this need for more computer power, overall performance, internal security, file and data management, and backup capabilities. Utilities strive to fill some of the voids left by applications or operating system software. For the most part, utilities are meant to work in conjunction with your existing software.

In the past, an individual had to be a technical expert when it came to setting up the necessary control parameters for a particular utility program (a sort, merge, selective print, and so on). Quite often, they were complicated to run. Some of these utilities were stand-alone programs occupying a niche not filled by applications programs. The traditional mainframe utility programs, such as sort, merge, and print, have given way to desktop organizers and file managers that are now geared for individual use on a personal computer. Today, most microcomputer users initiate a wide variety of software utilities and are not even aware they are doing so. Some of the more popular utilities have been incorporated into the disk operating system as well as applications programs as commands.

DOS includes such utilities as COPY, SORT, FORMAT, BACKUP, RESTORE, TYPE (to print files), DIR (to list files in directories), RENAME (to rename files), CLS (to clear your monitor's screen), and many, many more. Utilities such as spell checkers, dictionaries, thesauruses, and grammar checkers are often included in word processing packages. Many applications programs include keyboard enhancing programs that allow you to store frequently used words and sentences you can then access with either a single keystroke or combination of a few keystrokes (also known as hot keys). Then, there are mouse utilities that allow you to program the right and middle mouse buttons for particular tasks.

While utility programs are getting easier for us to use, selecting the best one to accomplish a particular task can be somewhat difficult. If you look around to see what utilities are available, you will find there are thousands of various types on the market to choose from. To introduce you to the types, we have organized the various utility software/programs into eight categories: keyboard enhancement, desktop organizer, backup, file management, file maintenance, DOS shell, printer, and virus utilities.

Keyboard Enhancement Utilities

Keyboard enhancers, as the name implies, enhance the function of the PC keyboard. These programs (which are usually RAM resident programs) translate a single keystroke into user-defined **macro** commands. A macro consists of one instruction that represents many instructions. For example, Ctrl-Alt-C keystrokes

could be simplified as the Esc key with a user-defined macro. Any string of keystrokes or characters can be stored as a macro. More importantly, once you have defined the macro, it can be stored as a file for use with different applications. In short, by shortening commands and character strings, keystroke repetition is greatly reduced.

Desktop Organizer Utilities

Desktop organizers consist of programs that emulate such things as calculators, notepads, phone directories, calendars, and appointment books. Most of these utilities are RAM resident. This means they can be accessed from within other applications programs. For example, you can call up the calculator utility while you are currently working in a word processing application. An image of a calculator will "pop-up" in a small window on your monitor's screen. You then perform the necessary calculations, and return to the word processing application. Some desktop organizers allow you to take the resulting calculation and place it directly into the word processing document you are working on. This is refereed to as "cut and paste." Most programs included in desktop organizers also operate in this pop-up mode.

Backup Utilities

As computer specialists, we should all be familiar with backup utilities. Disk backup utilities provide us a cost effective way to backup a hard disk. Advanced features, such as automatic backup (backups taken at predescribed intervals), file compression (which allows more data to be placed on a diskette), and automatic disk formatting, make disk backup utilities a good alternative to the backup utilities supplied with most operating systems. Backup utilities also allow you to save your files to tape, or even to another hard disk.

File Management Utilities

As the capacities of hard disks increase, so does the need for file management utilities. Try keeping track of the files on a 2Gb hard disk without any type of file management utility. It is next to impossible. Adding to the problem can be a maze of subdirectories—originally set up to keep order—that can easily hide a file or two. File management utilities help you avoid these problems by manipulating files and directories. They perform tasks such as searching for files, deleting files, tagging files (to allow for file manipulation on groups of unrelated files), relocating files, and setting file attributes. In short, file management utilities provide you with a convenient way to keep hard-disk directories, subdirectories, and the files themselves organized and under control.

File Maintenance Utilities

File maintenance utilities include file recovery utilities (including backup and restore) and programs that manipulate files, such as data compression and file security programs. File recovery utilities are designed to identify, diagnose, and repair every form of data and low-level format damage on standard DOS hard disks. One of the most critical areas of file maintenance is file recovery. If you should accidentally erase a file, it can easily be recovered (unerased) by using a recovery utility.

Compression utilities save disk space by reducing file size by 40 to 60 percent. Encryption utilities are designed for file security. Using one of several encryption algorithms, these utilities will encode a file so that it is readable only by reversing the encryption process. Other utilities are designed to "hide" files from the operating system; that is, the file "disappears" from the operating system and is only accessible with a password. Still others are designed to control access to files, programs, and communications devices.

DOS Shells

These utilities, called DOS shells, help translate DOS codes into English words, phrases, and diagrams. They act as a liaison between you and the operating system. They display disk and file information, adding commands not available in DOS and tend to simplify the execution of standard file management commands, such as DELETE, COPY, and PRINT.

Printer Utilities

Printer utilities provide software support for the enhanced fonts and graphics found in many printers. They also provide such features as menu control for printer functions, print spooling, and printing horizontally. Printer utilities allow you to use a printer that your applications software may not support. They also allow you to make better use of your standard printer.

Virus Utilities

Virus utilities are designed to keep out the malicious logic (unfriendly viruses) that attack

computer system software. This type of software is designed to prevent both known and unknown viruses from invading a system, and to detect and remove those already present. Virus detection software (IBMAV) is available free to all DON activities from Naval Command, Control and Ocean Surveillance Center In-Service Engineering, East Coast Division (NISEEAST), in Charleston, South Carolina. For more information concerning virus software, refer to chapter 2 in this module.

Utilities of the Future

What can you expect to see in the fuure? More and more, you will see vendors combining several utilities into one package. These packages will be difficult to categorize because they will work with operating systems, application programs, and peripherals. For example, a file maintenance utility may combine several commonly used programs such as disk diagnostic and recovery utilities, a DOS shell, hard-disk backup, a desktop manager, and a disk optimizer (a compression utility).

So, how do you go about staying on top of the latest and greatest utility packages available? That's easy ! You can learn about utility programs by reading trade magazines and software reviews. Let the experts do the leg-work of evaluation for you. There are so many utilities available on the market that it would be impossible for you to do a good job of evaluating them on your own. Vendors of application software and local computer clubs are other good sources of information.

USER REQUIREMENTS

To translate user requirements into technical terms, the first skill you will need is the ability to communicate with the users. Usually, the users know what they want and need, but they do not always know how to phrase it and put it into a logical process. That is where you, the computer specialist, come into play. As communications specialists, we have to be able to translate their ideas into a logical process. One effective method we can use is pseudocode because the code can be easily read and understood by both users and communications specialists (figure 3-12). After we determine the process and document it in pseudocode, we take the pseudocode to the users for their review to make sure we have covered all of their needs. After talking with the users, we make any necessary changes, then go back to the users again. As the programmer, it is your responsibility to determine the necessity and feasibility of the user's requirements to avoid unnecessary or even impossible programming. We continue this process until the users have no more changes and approve the pseudocode. The approval is required before moving on to the development of the program requirements.

Determine System Software Requirements

When we start to determine the system software requirements, we look at the pseudocode and the user's requested end product(s) to determine whether a commercial software package is available to accomplish the job or if we will need to develop an in-house program.

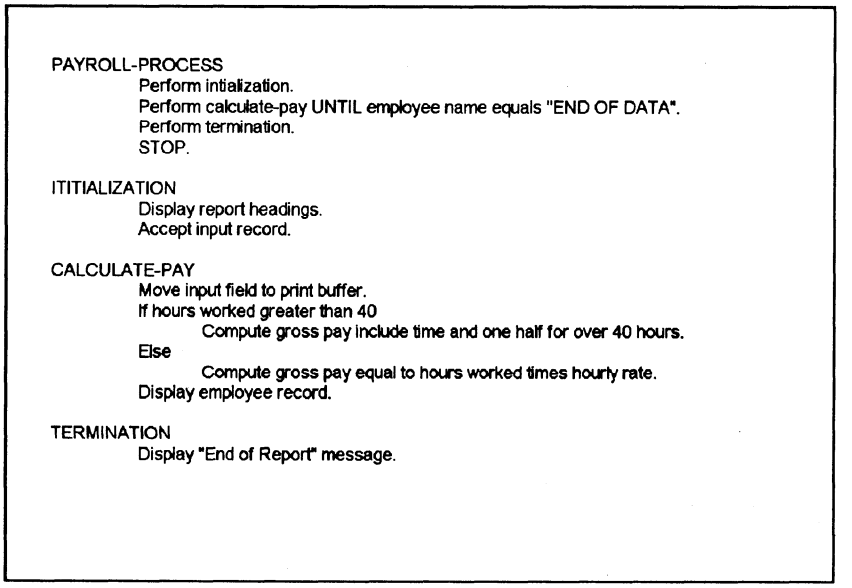

Figure 3-12.—Pseudocode example.

To determine whether the job can be done with a commercial software package, you need to be aware of the different software packages available and their capabilities and features. If it appears you can use a commercial software package and your AIS facility does not have it, start looking at the different government contracts in effect to locate the particular software package you are interested in. If the software is not available on contract, you will have to look for outside sources. Once you locate the software package and obtain approval for purchase, you can start the process of filling out the paperwork to order the software.

If you determine no commercial software is available to accomplish the user's request, you need to look at the expertise available in your AIS facility and what programming software is available at your facility to accomplish the job. Powerful software is available to mike the programmer's work easier. This software falls into one or more of the following categories:

- **Query languages.** Allow records to be printed or displayed in a specified format.
- **Database languages.** Allow records to be added or retrieved and manipulated following set formats.
- **Report generators.** Allow reports to be created from retrieved data records.
- **Application generators.** Allow the use of prewritten modules in creating a program.
- **High-level languages.** Allow the programmer to create a program from scratch.
- **Generalized software.** Directs certain internal computer functions.

Determine System Hardware Requirements

Once you determine the source of the program, whether a commercial or an in-house program, you need to look at what type of hardware will be required. Commercial software will have the hardware requirements stated in the paperwork. The users may have certain hardware requirements dictated to them that will have to be met. For example, a laser printer, a specific type of floppy drive, or a CD-ROM drive may be required. For in-house programs, it may be more difficult to determine the hardware needed until the program specifications are complete.

When additional hardware is required, you should first determine if it is available at the facility. You may find the hardware needed is not being used where it is located and you can move it to meet the new requirements. If the hardware is not available at the facility, begin the acquisition process. This process is the same as for software, except, in most cases, the requirements will have to go out on bids to several companies. With this process, it may take a long time to receive the hardware. You should plan accordingly.

Calculate Memory Requirements

When translating user requirements into an application, there are several things to keep in mind. We have covered the system software and hardware requirements; now, we turn our attention to the memory requirements. Calculate the memory requirements carefully; it will do no one any good to create a program that can not be run due to memory constraints of the system. Factors to be combined when calculating memory requirements are:

- the operating system,
- the program, and
- the data to be input.

By taking into consideration the memory requirements of each of these factors, there should be no problems (as far as memory goes) with running the programs.

I/O AND PROGRAM SPECIFICATIONS DEVELOPMENT

Once you develop the pseudocode and identify the software and hardware requirements, you can begin developing the I/O and program specifications. This is also a good time to determine what type of file organization method will best suit the application. The I/O specifications will require the users interaction to further detail what they need as input data and output material. They are your primary source for this information. To prepare the program specifications, you will use the pseudocode and design the program to match. Also, look at the memory and storage requirements for the program. You may have to adjust the hardware requirements to match the program specifications. Be sure you are not going to overload the computer system.

File Organization

File organization is the technique of physically arranging the records of a file on a storage media. When the programmer creates a subschema, a determination must be made on how the file will be accessed by the program. The three file organizations methods used are: sequential, indexed sequential, and direct.

- **Sequential file organization.** In sequential file organization, the records are in the same order as they were written to the file.

- **Indexed sequential file organization.** In indexed sequential file organization, the records are stored in sequence according to a primary key and an index is created to allow random access of the file. This type of organization also allows the file to be accessed sequentially. Indexed sequential is the most commonly used type of file organization.

- **Direct file organization.** In direct file organization, the records are stored and retrieved using a relative record number, which gives the position of the record in the file. This type of organization also allows the file to be accessed sequentially.

DATABASE MANAGEMENT SYSTEMS (DBMS)

A database management system (DBMS) is a software package that provides an integrated source of data for multiple users, while presenting different views of that data to different users. It can be characterized as generalized software that provides a single flexible facility for accommodating different data files and operations, while demanding less programming effort than conventional programming languages. It features easy access to the data; it facilitates the storage and maintenance of large volumes of data; and, most importantly, it provides the capability for sharing the data resources among different types of users.

Database management systems range from elementary systems with single record structures, providing rudimentary report formatting facilities, to very elaborate systems. The very elaborate systems handle several files with hierarchical or relational structures, perform functions in an online mode, and have sophisticated query and report writing capabilities.

DBMSs are being used on a wide variety of computers in the Navy. Because of this, no one DBMS by any single manufacturers discussed in this chapter.

Most of the problems with DBMSs in Navy computer systems are the same as in the civilian workplace. A few of these problem areas are noted below:

- Users do not want to share their data with others in the database.

- Data representation is inadequate.

- Privacy and safeguarding of proprietary information are not sufficient.

- Different views of data are needed by technical and nontechnical DBMS users.

- Data structures are not tailored to individual user requirements.

The wide use of DBMSs in the Navy indicates that all or most future operating systems will be oriented primarily toward DBMS. Slowly, but surely, the DBMS problems in the preceding list are being eliminated through better and more sophisticated software, coupled with advanced training of users on such software usage.

Take a look at the changes that have been made from the conventional system file structure to the database management system structure. As shown in figure 3-13, a conventional system is many application

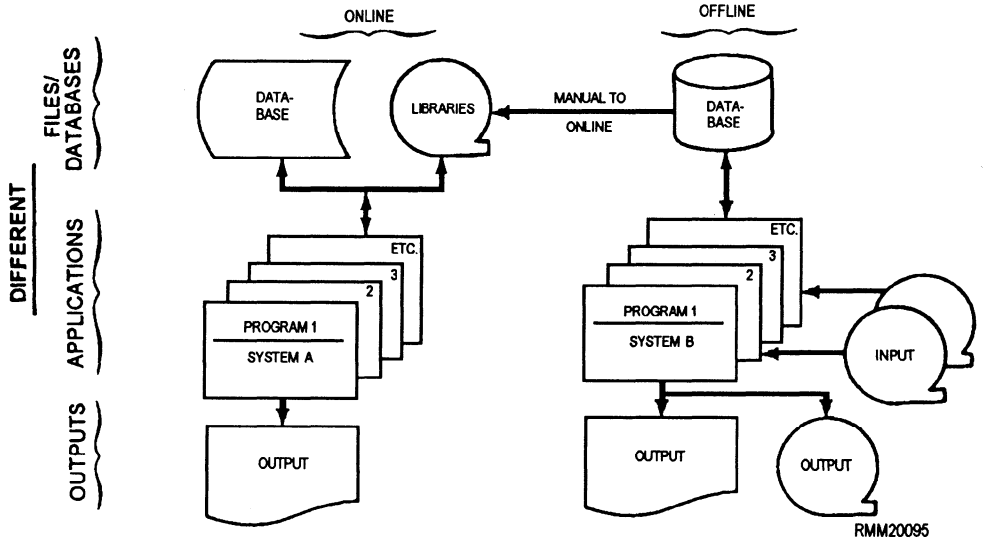

Figure 3-13.—A conventional system.

programs or systems using different databases and files. These databases and files are systems that are either online or offline; at any rate, they must be online at execution time. Under a conventional system, when the same data was needed in SYSTEM A and in SYSTEM B, it was usually duplicated. This redundancy of data is not acceptable to the AIS community. The following problems are just a few of those that exist when redundancy of data is required:

- Excess storage is required.
- An excessive number of personnel is required to handle and manipulate the data.
- A greater chance of error is possible when updating all the common data in different databases and files.
- Excessive funds are expended for report production for management.
- Excessive CPU time is expended when collecting data for reporting.
- Data integrity is harder to maintain because of the greater chance of error.

To overcome these problems, many Navy AIS facility are using a DBMS. This has produced a better record in operations and productivity than its predecessor, the file management system. DBMS software evolved from many different software improvements, from many different manufacturers. None of the many DBMSs function exactly alike. Regardless of the manufacturer's software installed at a particular AIS facility, a basic DBMS can be conceptually depicted as shown in figure 3-14. Take a few minutes to study the figure and refer to it as you study this section. You need to understand the concepts before we pictorially depict a DBMS execution event. The concepts include schemas, subschemas, data definition language (DDL), and data manipulation language (DML).

Schema

A schema is a complete description of a database, and consists of data definition language (DDL) entries. It includes the names and descriptions of *all* of the areas, set types, record types, and associated data items and data aggregates as they exist in the database and are known to the DBMS. In other words, it is the overall logical database description or framework into which values of data items can be fitted. A schema can be viewed like the bins in a storage house holding supplies. The schema will not change, but the data values will.

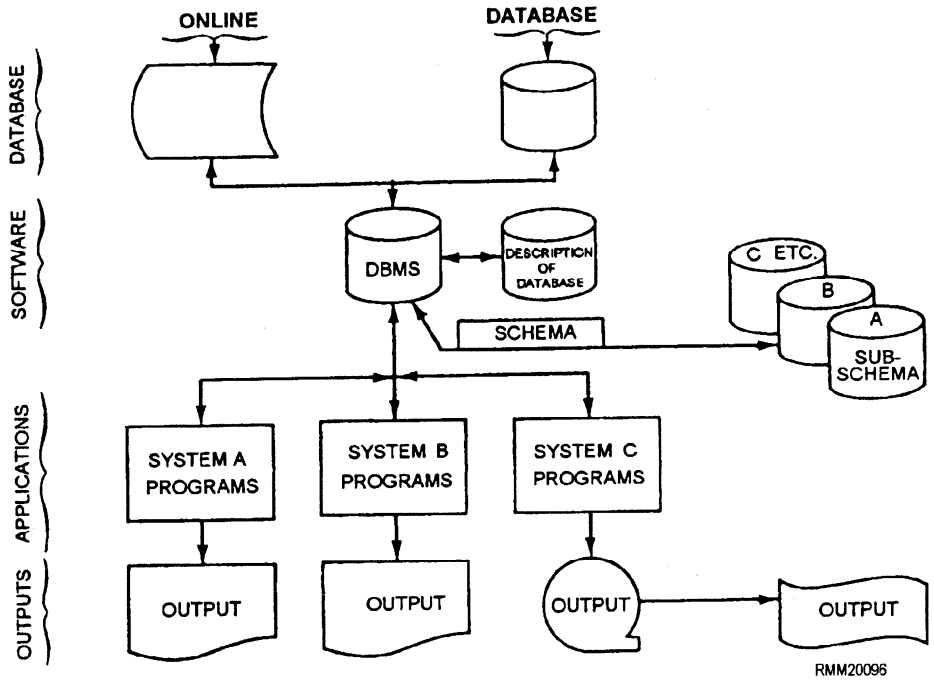

Figure 3-14.—A database management system (DBMS).

Subschemas

A subschema is the applications programmer's view of the data within the database pertinent to the specific application. A subschema has access to those areas, set types, record types, data items, and data aggregates of interest in the pertinent application to which it was designed. Naturally, a software system usually has more than one programmer assigned and includes more than one application. This means there are usually many different subschemas for each schema.

The following are a few of the many reasons subschemas are used:

- Subschemas provide different views of the data to the user and the programmer, who do not need to know all the data contained in the entire database.
- Subschemas enhance security factors and prohibit data compromise.
- Subschemas aid the DBA while assuring data integrity.

Each data item included in the subschema will be assigned a location in the **user working area** (UWA). The UWA is conceptually a loading and unloading zone, where all data provided by the DBMS in response to a CALL for data is delivered. It is also where all data to be picked up by the DBMS must be placed.

Schema Data Definition Language (DDL)

The schema data definition language (DDL) is used for describing a database, which maybe shared by many programs written in many languages. This description is in terms of the names and characteristics of the data items, data aggregates, records, areas, and sets included in the database, and the relationships that exist and must be maintained between occurrences of those elements in the database.

- **Data item.** A data item is an occurrence of the smallest unit of named data. It is represented in a database by a value.
- **Data aggregate.** A data aggregate is an occurrence of a named collection of data items within a record. There are two kinds-vectors and repeating groups. A vector is a one-dimensional sequence of data items, all of which have identical characteristics. A **repeating group** is a collection of data that occurs a number of times within a record occurrence. The collection may consist of data items, vectors, and repeating groups.
- **Record.** A record is an occurrence of a named collection of zero, one, or more data items or data aggregates. This collection is specified in the schema DDL by means of a record entry. Each record entry in the schema for a database determines a type of record, of which there may be an arbitrary number of record occurrences (records) in the database. For example, there would be one occurrence of a PAYROLL-RECORD type of record for each employee. A **database key** is a unique value that identifies a record in the database to a run unit (program(s)). The value is made available to the run unit when a record is selected or stored and maybe used by the run unit to reselect the same record.
- **Set.** A set is an occurrence of a named collection of records. The collection is specified in the schema DDL by means of a set entry. Each set entry in the schema for a database determines a type of set, of which there may be an arbitrary number of set occurrences (sets) in the database. Each type of set specified in the schema may have one type of record declared as its owner type of record, and one or more types of records declared as its member type of record. Each set occurrence (set) must contain one occurrence of its defined **owner type of record** and may contain an arbitrary number of occurrences of each of its defined **member type of record** types. For example, if a set type QUALIFICATIONS was defined as having owner record type EMPLOYEE and member record types JOB and SKILL, each occurrence of set type QUALIFICATIONS must contain one occurrence of record type EMPLOYEE, and may contain an arbitrary number of occurrences of record types JOB and SKILL.
- **Area.** An area is a named collection of records that need not preserve owner/member relationships. An area may contain occurrences of one or more record types, and a record type may have occurrences in more than one area. A particular record is assigned to a single area and may not migrate between areas.
- **Database.** A database consists of all the records, sets, and areas that are controlled by a specific schema. If a facility has multiple databases, there must be a separate schema for each database. Furthermore, the content of each database is assumed to be independent.
- **Program.** A program is a set or group of instructions in a host language such as COBOL or

FORTRAN. For the purpose of this chapter, a **run unit** is an execution of one or more programs.

Data Manipulation Languages (DMLs)

A data manipulation language (DML) is a language used to cause data to be transferred between a run unit and the database. A DML is not a complete language by itself. It is called a **query language** by some manufacturers. It relies on a host language to provide a framework for it and to provide the procedural capabilities required to manipulate data.

DBMS Events

To depict DBMS events, we selected the READ function. The sequence depicted in figure 3-15 provides a conceptual example of an application program of a particular software system reading a record. It is intended as a conceptual training aid for instructional purposes only.

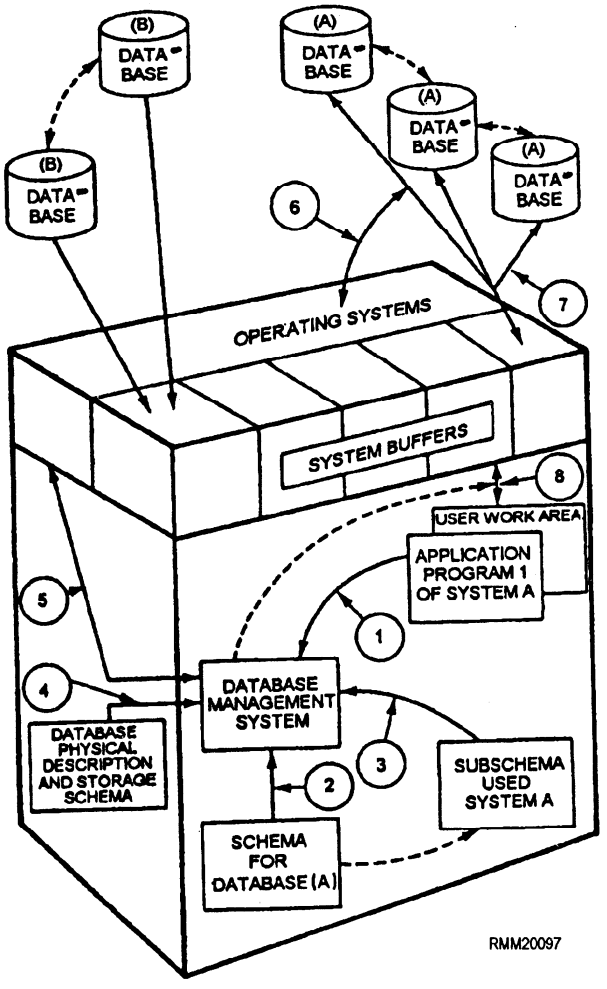

Figure 3-15.—A conceptual view of the events that take place when an application program reads a record in a system interfaced with a DBMS.

The numbered arrows in figure 3-15 trace a call for data by application Program 1 of System A. (Calls for data by other programs maybe handled concurrently by the DBMS, but this is not depicted in the figure.) The following events (numbered to correspond with figure 3-15) take place, depending on the software system in use, when a program attempts to read a record:

1. DML Program 1 of System A makes a call for data from Database (A) to the DBMS.

2. The DBMS analyzes the call and supplements the arguments provided in the call itself with information provided by the schema for Database (A), and the subschema referenced by Program 1.

3. The DBMS obtains the subschema used for System A and retrieves the description of the data in question.

4. The DBMS examines the database physical description and keys the actual physical record to read.

5. On the basis of the call for its services and the information obtained from the schema and subschema, the DBMS requests physical I/O operations, as required to execute the call, from the operating system.

6. The operating system (OS) interacts with the storage media containing the database.

7. The operating system then delivers the requested data from the actual database to the system buffers.

8. The DBMS transfers data, as required to fulfill the call, between the system buffers and the user work area (UWA) of Program 1, which originated the call. Any required data transformations between the representation of the data as it appears in the database (as declared in the schema) and the representation of the data as it appears in a program's UWA (as declared by the subschema) are handled by the DBMS.

The DBMS provides status information to program 1 based on the outcome of its call, for example, error indications. The data in Program 1's UWA may be manipulated as required, using the facilities in the host language. The system buffers are shared by all programs serviced by the DBMS. Remember, programs interact with the system buffers entirely through the DBMS.

Schema DDL and Hardware

A schema DDL entry does not include references to a physical device or media space. Thus, a schema written using a DDL is a description of a database that is not affected by the devices or media used to store the data. The database may, therefore, be stored on any combination of storage media that is supported in a particular DBMS. Because of their sequential nature, some devices, such as magnetic tape, may not take full advantage of the facilities included in a DDL. Such devices are not precluded, however, and may be perfectly adequate for some of the data.

Chances are the DDL you are using will follow the guidelines created by the Conference on Data Systems Languages (CODASYL) and their subcommittee, Data Base Task Group (DBTG). These guidelines have influenced the development of database systems, particularly those for the larger computer systems.

Because of space limitations, the format specifications for a DML and a schema DDL are not presented. The syntax rules for a data description language are similar to those for COBOL and are too technically extensive to include in this chapter. For example, a DDL has a character set, words (programmer supplied), reserved words, key words, names, literal and nonnumeric literal formatting, and many other qualification rules.

Schema/Subschema Data Conversion

Since data description in the subschema is host language oriented, the syntax used in the subschema to describe the characteristics of data items may differ from that in the schema or storage schema. This means that data types that turn out to have the same representation in a given implementation may be described differently in the schema and storage schema than in the subschema. Also, there maybe data types defined in the subschema that have characteristics and representations different from those of any schema type, and vice versa. However, any data item description is eligible for inclusion in a subschema for a particular host language subschema data description entry if one of the following conditions is satisfied in the implementation involved:

- The data item has the same representation both in the database and in the UWA in that implementation,

- A conversion procedure has been provided by the implementor, or

- A conversion procedure has been provided by the database administrator.

The implementor is responsible for defining the correspondence between the schema data types and specifications and the sub schema data types and specifications, in terms of the representation of these respective data types in the implementation. An example of a correspondence that might be established by an implementor would be correspondence between coded arithmetic data in the schema and COMPUTATIONAL data in the COBOL subschema.

The implementor might provide special conversion procedures in addition to those in the DBMS for implementing the conversion rules. An example of a case where the implementor might provide a special conversion procedure would be in the interface between the DBMS and database procedures written in particular host languages. If the DBMS supplies a standard parameter list to database procedures, the representation of some of the parameter values might not match that of any data type in a particular host language. In this case, the implementor might wish to provide a standard conversion procedure to allow the host language to correctly access such values.

Developers of host language database facilities may provide rules defining the intended correspondence between data types allowed in their host language subschema DDL and the data types in the schema DDL. Such rules may be specified directly, naming characteristics of subschema data types so that they can be matched with the characteristics of schema data types. Different host languages may define their rules for intended data type correspondence in terms of the closest schema equivalents; for example, FORTRAN referring to schema TYPE specifications and COBOL referring to schema PICTURE specifications. In this case, the conversion rules specified as part of the schema DDL may be used in determining appropriate conversions involving data types not explicitly mentioned in the host language's defined rules. For example, the COBOL database facility might specify the intended correspondence between its subschema PICTURE specifications and schema PICTURE specifications. With the correspondence between schema and subschema PICTURES established, subschema PICTURE specifications may be interpreted as if they were schema PICTURE specifications. The schema DDL defined conversion rules (which define conversions between schema PICTURES and other schema data types) can then be used to determine appropriate

conversions between subschema PICTURES and any schema data type.

Schema DDL and DML

The relationship between a schema DDL and a DML is the relationship between declaration and procedure. The DDL declarations impose a discipline over the executable code and are to some extent substitutes for procedures written in the DML and the host language.

To specify the relationship between DDL declarations and DML commands, a set of basic data manipulation functions must be defined that is independent of the DML and the host language. Specific commands provided by a particular DML must be resolved into those basic functions. The resolution is defined by the implementor of the DML.

The basic data manipulation functions assumed in these specifications include the functions required to:

- Select records
- Present records to the run unit
- Add new records and relationships
- Change existing records and relationships
- Remove existing records and relationships

Schema and Storage Schema

The concept of separate schema and storage schema allows the separation of the logical description of the entire database from the storage description of the same. This concept is significant from the following points of view:

1. A database administrator may design a schema structure consisting of logical record relationships that sensibly match the totality of applications under implementation or likely to be implemented.

2. Efficiency considerations are separated from the logical description by specifying the storage environment and schema to storage schema mappings in the storage schema. Tuning may be carried out by changing the storage schema without alteration to the schema, subschemas, and programs.

The storage schema describes the representation of stored data in device independent terms. The database may, therefore, be stored on any combination of storage media that is supported by a particular implementation. The database administrator may allocate media and devices with differing characteristics to suit the command's operational requirements, without alteration to the storage schema.

Database Management System Selection

When selecting a DBMS, the primary consideration should be to select a technology that will support the long-term DBMS needs. The work of identifying the needs of the command should be done in a very careful and thorough manner. The ultimate goal is to make the best choice for the command.

One of the best ways of identifying the needs of the command is to conduct interviews with the users. The results of the interviews will identify areas of concern to them, such as:

- How fast can data be accessed?
- How easy is it to retrieve and manipulate the data?
- How fast and easy is it to develop quality applications?
- Will the redundancy of data be reduced?
- Will it provide for the management and accurate identity of all the data elements?

Once the needs of the command have been identified, it is time to prepare the presentation for management. A first step in the preparation of the presentation is to describe how the needs of the command will be addressed by the DBMS. Develop specific examples to illustrate how each item identified would be handled in the database environment.

After receiving permission from management to continue, you can start the selection process. Since all DBMS software is not the same, you must look at the quality of the product and the ability of the vendor to continue to enhance the product in the future. All of the decisions should be based on the features currently available or in a beta testing environment. The goal is not to find the perfect DBMS, but to identify and recommend the best of those available that will meet the command's needs.

This selection criteria applies whether the DBMS is going to be used on a mainframe computer or a microcomputer system. However, the microcomputer system has a few added concerns that must be met. The most important of these concerns are:

- The capability of receiving downloaded data from a mainframe or another microcomputer
- The ability to be used on a network
- The ability to enable quick and easy setup of screen formats
- The ability to handle a maximum number of records, fields, tables, and so on, and the size of each
- The ability of the software to accept files in multiple formats and to transport files and records out to other microcomputer packages

LOGICAL STRUCTURE OF A DATABASE MANAGEMENT SYSTEM

To decide on the logical structure to use with a DBMS, you will need to first perform a comprehensive review of the data. Determine what data is needed, where the data comes from, and how the data will be used. Look at the reports needed. Find out what transactions and displays are most appropriate for collecting and manipulating the data. At this point, you can determine what programs and queries will need to be developed and decide on the best organization for the data.

The programmer will be the one to decide the organization of the database and to define the physical structures of the database management system. Programs to process the transactions and to generate the anticipated management information and decision support reports are mapped out, using the pseudocode and flowcharts. Once the programs are mapped out, they are written, tested, and implemented, creating the database management system.

SUMMARY

As a communications specialist, you need to know a lot more about computers than just how to operate them. You must have a good working knowledge of computer software. You should be able to explain and demonstrate how to use systems and applications software to both communications specialists and end-user personnel. You will need to interact with the users to determine their requirements and needs. We covered how to determine system software and hardware requirements and the importance of calculating memory requirements. We discussed the parts of a database management system (DBMS) and the selection process for a DBMS, including those for personal computers.

APPENDIX I

GLOSSARY

A

ABORT— Procedure for terminating a program when a mistake, malfunction, or error occurs.

Ada— A high-level programming language designed by the Department of Defense.

ADDRESSING— Locating a required piece of data by specific techniques.

ARITHMETIC-LOGIC UNIT— The part of the cpu that contains the logic capability and performs all the arithmetic functions (addition, subtraction, multiplication, and division).

ARTIFICIAL INTELLIGENCE— The capability of a machine to perform human-like intelligence functions, such as learning, adapting, reasoning, and self-correction.

ASSEMBLER— A computer program that translates assembly language programs into machine language (object) programs.

B

BASIC (Beginners All-Purpose Symbolic Instruction Code)— A high-level, general-purpose programming language used primarily on microcomputers.

BIT MAPPING— A data structure that describes a bit image being held in computer storage.

BUBBLE MEMORY— Method by which information is stored as magnetized dots (bubbles) that rest on a thin film of semiconductor material.

C

C++ — An object-oriented version of the C programming language.

CACHE MEMORY— A faster memory in which parts of the information in the main (slower) memory or disk are copied.

CARRIER PACKAGE— The portion of the microprocessor chip that plugs into the motherboard.

CERTIFIER— The piece of equipment that is used to certify magnetic tape and check for errors.

COBOL (COmmon Business Oriented Language)— A high-level programming language designed for business-type applications.

COMPILER— A program that translates a source program written in a high-level programming language into machine language.

CONTROL MEMORY— RAM consisting of addressable storage registers, primarily used in mini- and mainframe computers.

D

DEGAUSSER— Device used to erase information from magnetically recorded media, such as a floppy disk or magnetic tape.

DIAGNOSTIC LIGHT-EMITTING DIODES— Indicator lights used to help isolate a hardware failure.

DIAGNOSTIC ROUTINE— Routine designed to locate a malfunction in the central processing unit or a peripheral device.

DISTRIBUTED SYSTEM— A computer system designed to operate as a communications network with al1 its terminals linked to a remotely located central processing unit.

DUPLEX— Pertaining to a communications system or equipment capable of transmission in both directions.

E

EXTERNAL DIAGNOSTICS— Diagnostics that can be run from a peripheral device.

F

FILE FRAGMENTATION— Files that are split into many noncontiguous areas on the disk.

FINITE— To have limits, an end, or a last number.

FIVE-PIN CONNECTOR— A connector that has five pins, usually used to connect a keyboard to the CPU.

FORTRAN (FORmula TRANslator)— A high--level programming language for scientific and mathematical applications.

H

HARD-SECTORED— Wedge-shaped storage division on a floppy disk from time of manufacture.

HIERARCHICAL DIRECTORY— A term used to refer to the organizational method of arranging files either in a DOS tree structure or in the file-and-folder method.

HUB— The center part of the tape reel that attaches to the tape drive.

HYPERTEXT— A document retrieval network having till-text files and dynamic indexes for links among documents.

HYPOTHERMAGRAPH— A piece of equipment that is used to record the temperature and humidity in a computer room.

I

INSTRUCTION AND CONTROL— The portion of the control section that includes the combinational and sequential circuits that make up the decision-making and memory-type functions.

INTEGRATED CIRCUIT— A miniaturized chip in which semiconductor components and other such technology combine the functions of a number of conventional components (such as transistors, resistors, capacitors, and diodes).

INTERNAL DIAGNOSTICS— Diagnostics that are run when the computer is started.

IPL (Initial Program Load)— A set of instructions that cause other instructions (the operating system) to be loaded into the main memory of the computer. This must be done each time the computer is turned on.

J

JULIAN DATE— Form of calendar representation within a computer system, indicating the year and the number of elapsed days in the year.

L

LETTER-QUALITY MODE— The mode that produces high--quality printed output from a printer.

LIBRARIAN— Person responsible for the safekeeping of all computer files, such as diskettes, disk packs, and magnetic tapes.

LOCAL-AREA NETWORK— A network that normally operates within a well-defined and generally self-enclosed area. The communication stations or terminals are linked by cable.

M

MAGNETIC CORE STORAGE— System of storage in which data is represented in binary form by means of directional flow of magnetic fields in tiny, doughnut-shaped arrays of magnetic cores.

MAGNETIC DOMAINS— The data that is stored by changing the polarity of the magnetized dots (bubbles).

MAINFRAME COMPUTERS— This term is usually used to designate large-scale computer systems, although the precise definition of mainframe is the cpu and the control elements of any computer system.

MATRIX— Orderly array of symbols by rows and columns.

MINICOMPUTERS— Midsize computers that are smaller than large-scale systems but with the same components. They are less expensive and have less strict environmental requirements.

MODEM— A device that converts data from digital to analog format for transmission on analog transmission lines, and also converts data in analog format to digital format for computer processing.

MULTIPLE-FILE DIRECTORIES— An option of the operating system that allows for several files to be contained in a directory.

N

NONVOLATILE STORAGE— Storage medium that retains its data in the absence of power.

O

OXIDE— A ferrous material that can be magnetized; also, the recording side of the magnetic tape (dull side).

P

PARALLEL PROCESSING— Handling all the elements of a word or message simultaneously.

PASCAL— High-level structured programming language that has gained wide acceptance as a tool for both applications programming and system development.

PENTIUM CHIP— A processor chip that can execute many instructions at the rate of two instructions per clock cycle.

PERIPHERAL EQUIPMENT— Equipment used for data entry, storage, or retrieval, but which is not part of the central processing unit. Peripherals include crt displays, terminals, printers, and mass storage (tape, disk, and drum) devices.

PHOTOELECTRIC CELL— A mechanism that when activated by a light source emits an electrical impulse.

Q

QUERY— To make a request for information from a database system.

R

RECONCILING— Refers to the correcting of processing discrepancies.

RELATIONAL DATABASE— A database organization scheme that treats files as tables of data in which the rows represent fixed-length records and columns represent fields.

RIGID— Refers to the hard metal platters (usually constructed of aluminum or glass) that comprise a hard disk.

S

SCHEMA— Structure for organizing knowledge relative to context or expectations.

SCRATCHING MAGNETIC MEDIA— Making the magnetic media available to the computer operator for reuse.

SCSI ADAPTER— A general purpose parallel interface designed for connecting one or more computers and one or more peripherals. A total of 8 devices may be connected to one bus.

SEMICONDUCTOR— A crystalline substance that conducts electricity when it is "doped" with chemical impurities.

SERIAL— Pertaining to the sequential occurrence of two or more related activities in a single device.

SILICON CHIP— Tiny portion of a silicon wafer with thousands of electronic components and circuit patterns etched on its surface.

SIMPLEX— A mode of data transmission in which data can travel in only one direction on the line. When a terminal is connected to such a circuit, it can be used to either receive or send data to the cpu but not do both.

SINGLE-FILE DIRECTORIES— An option of the operating system that allows for only one file to be contained in a directory.

SOFT-SECTORED— Method of marking sectors or sections on a disk by using information written on the disk.

SPECIAL FUNCTION KEY— Key on a keyboard to control a mechanical function, initiate a specific computer operation, or transmit a signal that would otherwise require multiple key strokes.

STAND-ALONE— Self-contained computer system that can work independently, not connected to or under the control of another computer system.

STRIPPING— The removing of the first 100 feet of the magnetic tape. This is the portion that becomes contaminated and causes the most errors.

SUBSCHEMA— Logical organization of data required for a particular program.

SURGE PROTECTOR— Device that protects electrical equipment from being damaged by short surges of high voltage by filtering them out.

T

TIMING— The regulation of the flow of signals that control the operation of the computer.

TREE STRUCTURED DIRECTORY— A disk containing a root directory and several subdirectories.

TWENTY-FIVE PIN SERIAL CONNECTOR— A serial connector that has twenty-five pins, usually used for connecting a printer or monitor to the CPU.

U

UNIX— An operating system that has many high-level utility programs; it is capable of running a number of jobs at once.

UNSTRUCTURED DIRECTORY— A disk with only one directory contained on it.

V

VIRUS— A computer program which can wreak havoc on a system, either by destroying data or simply changing and slowing up the processing of the system.

APPENDIX II

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

A

ABEND— Abnormal end of job.

ALCS— Automated library control system.

ALU— Arithmetic/Logic unit.

ATLC— Automated tape library control.

C

CAD— Computer-aided design

CMOS— Complementary metal oxide semiconductor.

CODASYL— Conference on data systems languages.

COOP— Continuity of operations.

CPU— Central processing unit.

D

DASDI— Direct access storage device initialization.

DBMS— Database management system.

DBTG— Database task group.

DDL— Data definition language.

DML— Data manipulation language.

DOS— Disk operating system.

DTP— Desktop publishing.

E

EPROM— Erasable programmable read-only memory.

I

IC— Integrated circuits.

IPL— Initial program loading.

L

LAN— Local--area network.

LQ— Letter quality.

LSI— Large-scale integration.

M

MODEM— Modulator-demodulator.

P

PROM— Programmable read-only memory.

Q

QWERTY— Refers to the letter sequence QWERTY on the keyboard.

R

RAM— Random-access memory.

ROM— Read-only memory.

S

SOP— Standard operating procedure.

SYSRES— System resident.

U

UWA— User work area.

V

VLSI— Very-large-scale integration.

W

WORM— Write once, read many.

WYSIWYG— What you see is what you get.

APPENDIX III

REFERENCES USED TO DEVELOP THIS TRAMAN

NOTE: The following references were current at the time this TRAMAN was published, but you should be sure you have the current editions.

American National Dictionary for Information Processing Systems, Federal Information Processing Standards (FIPS) Publication 11-3, U.S. Department of Commerce, National Bureau of Standards, Washington, DC, 1991.

Banks, Michael, *The Modem Reference,* Second Edition, Brady Publishing, New York, NY, 1991.

Cannon, Don L., Gerald Luecke, *Understanding Microprocessors,* Howard W. Sams and Co., Indianapolis, IN, 1984.

Mueller, Scott, *Upgrading and Repairing PCs,* Fifth Edition, Que® Corporation, Indianapolis, IN, 1995.

Norton, Peter, and Robert Jourdian, *The Hard Disk Companion,* Simon&Schuster, Inc., New York, NY, 1988.

O'Leary, Timothy and Linda, *Microcomputing,* Annual Edition 1994-1995, McGraw-Hill, Inc., New York, NY, 1994.

Prasad, Nallur, Jeffrey Savit, *IBM Mainframes Architecture and Design,* Second Edition, McGraw-Hill, Inc., New York, NY, 1994.

Simon, Alan R., *The Computer Professional's Survival Guide,* McGraw Hill, Inc., New York, NY, 1992.

Spencer, Donald D., Ph. D., *Computer Dictionary,* Fourth Edition, Camelot Publishing, Co., Ormond Beach, FL, 1993.

Wang, W. E., Joe Kraynak, *The First Book of Personal Computing,* Second Edition, SAMS, Prentice Hall Computer Publishing, Carmel, IN, 1990.

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RADIOMAN TRAINING SERIES

MODULE 2 - COMPUTER SYSTEMS

NAVEDTRA 12846

Prepared by the Naval Education and Training Professional Development and Technology Center (NETPDTC), Pensacola, Florida

Congratulations! By enrolling in this course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement. Keep up the good work.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

ERRATA : If an errata comes with this course, make all indicated changes or corrections before you start any assignment . Do not change or correct the associated text or assignments in any other way.

TEXTBOOK ASSIGNMENTS: The text pages that you are to study are listed at the beginning of each assignment . Study these pages carefully before attempting to answer the questions in the course. Pay close attention to tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives .

SELECTING YOUR ANSWERS: After studying the associated text, you should be ready to answer the questions in the assignment. Read each question carefully, then select the BEST answer. Be sure to select your answer from the subject matter in the text. You may refer freely to the text and seek advice and information from others on problems that may arise in the course. However, the answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

ANSWER SHEETS: You must use answer sheets designed for this course (NETPMSA Form 1430/5, Stock Ordering Number 0502-LP-216-0100) . Use the answer sheets provided by Educational Services Officer (ESO) or you may reproduce the one in the' back of this course booklet.

SUBMITTING COMPLETED ANSWER SHEETS: As a minimum, you should complete at least one assignment per month. Failure to meet this requirement could result in disenrollment from the course. As you complete each assignment , submit the completed answer sheet to your ESO for grading. You may submit more than one answer sheet at a time.

GRADING : Your ESO will grade each answer sheet and notify you of any incorrect answers. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, your ESO will list the questions you answered incorrectly

and give you an answer sheet marked "RESUBMIT." You must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

COURSE COMPLETION: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment, your command should give you credit for this course by making the appropriate entry in your service record.

NAVAL RESERVE RETIREMENT CREDIT: If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 5 points. (Refer to BUPERSINST 1001.39 for more information about retirement points.)

STUDENT QUESTIONS: If you have questions concerning the administration of this course, consult your ESO. If you have questions on course content, you may contact NETPDTC at:

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Commercial: (904) 452-1501
FAX: 922-1819
INTERNET:
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COURSE OBJECTIVES: In completing this nonresident training course, you will demonstrate a knowledge of the subject matter by correctly answering questions on the following subjects:

Computer Hardware Startup, Computer Center Operations, and Data Management.

Naval courses may include several types of questions--multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. You can readily identify the type of each question, and the action required, by reviewing of the samples given below.

MULTIPLE-CHOICE QUESTIONS

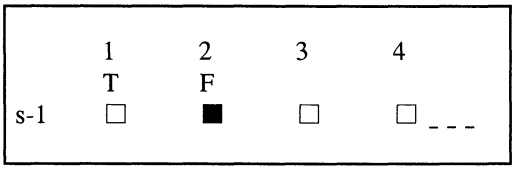
Each question contains several alternative answers, one of which is the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. The first U.S. Navy nuclear-powered vessel was what type of ship?

1. Carrier
2. Submarine
3. Destroyer
4. Cruiser

Indicate in this way on your answer sheet:



TRUE-FALSE QUESTIONS

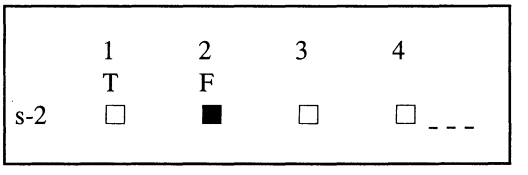
Mark each statement true or false as indicated below. If any part of the statement is false, the entire statement is false. Make your decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. Shock will never be serious enough to cause death.

1. True
2. False

Indicate in this way on your answer sheet:



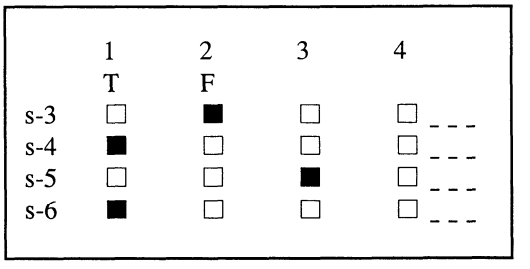
Each set of questions consists of two columns, each listing words, phrases or sentences. Your task is to select the item in column B which is the best match for the item in column A. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on your answer sheet.

SAMPLE

In answering questions s-3 through s-6, SELECT from column B the department where the shipboard officer in column A functions. Responses may be used once, more than once, or not at all.

A. OFFICER	B. DEPARTMENT
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Disbursing Officer	3. Supply Department
s-6. Communications Officer	4. Navigation Department

Indicate in this way on your answer sheet:



ASSIGNMENT 1

Textbook Assignment: "Computer Hardware Startup," chapter 1, pages 1-1 through 1-25.

1-1. The central processing unit of a digital computer is made up of a central control section and work areas that are needed to perform calculations and manipulate data. What are the names of the sections within the CPU?

1. Control, internal storage, and arithmetic-logic
2. Control, working storage, and programming storage
3. Internal storage, arithmetic-logic, and working-storage
4. Arithmetic-logic, input/output storage, and internal storage

1-2. Within the CPU, what section maintains order and directs the flow of operations and data?

1. Logic
2. Control
3. Program storage
4. Internal storage

1-3. Within the CPU, the internal storage section normally contains which of the following storage areas?

1. Input and output only
2. Output and program only
3. Input, program, and working only
4. Input, output, program, and working

1-4. What type of memory allows you to read data from or write data into it just by giving the computer the address of the location where the data is stored or is to be stored?

1. ROM
2. RAM
3. PROM
4. EPROM

1-5. Most computers can permanently store often used instructions, such as those used to boot-strap the computer, in memory. What type of memory makes this possible?

1. Permanent
2. Read-only
3. Inaccessible
4. Programmable

1-6. What type of storage (memory) allows you to enter any program you desire, but once the memory has been written into, it can never be altered or changed?

1. ROM
2. RAM
3. PROM
4. EPROM

1-7. Which of the following types of storage is normally outside the main body of the computer and is used to store programs and data for future use?

1. Map storage
2. Hyper storage
3. Secondary storage
4. Peripheral storage

1-8. Anytime an input or output device is under the direct control of the CPU, we say the device is in what mode?

1. Online
2. Offline
3. Stand-by
4. Parallel

1-9. Which of the following components is NOT considered an input/output (I/O) device?

1. Computer terminal
2. Scanners
3. Floppy disks
4. Magnetic tape unit

1-10. Whether an I/O channel is input only, output only, or both input and output is determined by what person or primary factor?

1. The systems analyst
2. The maintenance programmer
3. The design of the CPU itself
4. The specific type of peripheral device

1-11. An I/O channel that is capable of communicating in both directions but in only one direction at a time is what type of channel?

1. Half-duplex
2. Full-duplex
3. Half-simplex
4. Simplex

1-12. Under full-duplex I/O channel operations, communications are possible in which of the following directions?

1. From the computer to the terminal only
2. From the terminal to the computer only
3. In both directions simultaneously
4. In both directions, one direction at a time

1-13. When data is transmitted over a communications channel in a serial fashion, the data is sent or received in which of the following forms?

1. Bits
2. Words
3. Records
4. Characters

1-14. Which of the following devices is used to convert a digital signal produced by your terminal to an audio signal suitable for transmission over a communication line?

1. A line conditioner
2. A signal generator
3. A modulator-demodulator
4. An analog-to-digital simulator

1-15. What microcomputer unit processes the data, performs arithmetic and logic functions, and maintains control of the system?

1. RAM
2. System unit
3. Display unit
4. Hard disk drive

1-16. The disk controller board, video board, and input/output boards are plugged into what board?

1. Memory
2. System
3. Mother
4. Serial/parallel

1-17. Microprocessor chips contain what three types of circuitry?

1. Memory, control logic, and instruction decoding
2. Memory, instruction decoding, and arithmetic-processing
3. Operating system, control logic, and arithmetic-processing
4. Control logic, instruction decoding, and arithmetic-processing

1-18. The system board (mother board) contains which of the following types of chips?

1. RAM and ROM only
2. RAM, ROM, and I/O integrated chips only
3. I/O integrated circuit chips and microprocessor chip(s) only
4. RAM, ROM, I/O integrated chips, and microprocessor chip(s)

1-19. Compared with a computer that processes 8 bits at a time, a computer that handles 32 bits at a time has which of the following advantages?

1. Processes program instructions faster
2. Can accommodate a larger primary memory
3. Both 1 and 2 above
4. Can accommodate a modem

IN ANSWERING QUESTIONS 1-20 THROUGH 1-22, SELECT THE DESCRIPTION IN COLUMN B THAT MATCHES THE MICROCHIP LISTED IN COLUMN A.

	A. CHIPS	B. DESCRIPTIONS
1-20.	8086	1. 8-bit
1-21.	8088	2. 16-bit
1-22.	386DX	3. 32-bit
		4. Hybrid

1-23. What type of chip is the 80287?

1. RAM
2. DOS
3. I/O circuit
4. Math coprocessor

1-24. Which of the following terms is NOT used interchangeably with the term monitor?

1. Display
2. System unit
3. Display device
4. Cathode-ray tube

1-25. Most color monitors are of the RGB type. What does RGB mean?

1. Red-green-blue
2. Red-gold-blue
3. Raster gauge beam
4. Registered global beam

1-26. Depending on the amount of RAM available, color monitors can display what range of colors?

1. 8 to 256
2. 16 to 256
3. 8 to 16,000,000
4. 16 to 16,000,000

1-27. Most monitors will have an LED indicator light. What does LED mean?

1. Light-emitting diode
2. Light-enhancing diode
3. Low-emitting device
4. Low-enhancing device

1-28. What characteristic determines the sharpness of the monitor screen image?

1. Color
2. Resolution
3. Refraction
4. Screen size

1-29. The number of dots or pixels per square inch of screen measures what characteristic?

1. Color
2. Refraction
3. Resolution
4. Screen size

1-30. A screen with a resolution of 1280 by 1024 has what total number of pixels?

1. 1,024
2. 1,280
3. 2,304
4. 1,310,720

1-31. By what means are characters created on the screen?

1. Dot-matrix
2. Dot mapping
3. Line drawings
4. Opaque images

1-32. To individually control each dot or pixel on a display screen, what technique can be used?

1. Dot display
2. Bit display
3. Dot mapping
4. Bit mapping

1-33. Having a display device that can automatically switch to any standard graphics card allows you to take which of the following actions?

1. Upgrade the graphics board without upgrading the display unit
2. Use any graphics package regardless of operating system
3. Perform system and display diagnostics more rapidly
4. Each of the above

1-34. What is the function of the keyboard?

1. To receive output from the microcomputer
2. To input data into the microcomputer only
3. To input programs into the microcomputer only
4. To input data and programs into the microcomputer

1-35. In addition to alphabetic characters, numbers, and special characters, keyboards have what other types of keys?

1. Control only
2. Function only
3. Control and function
4. Operation

1-36. What key usually stops the execution of an operation or function?

1. Escape
2. Delete
3. Return
4. Control

1-37. Keys can be combined to perform special functions. For example, pressing the CTRL, ALT, and DEL keys at the same time on most IBM compatible personal computer systems would have what result?

1. Reboot the operating system
2. Load a new applications program
3. Display a help screen
4. Store the file displayed on the screen

1-38. To tell the computer you have entered data or instructions and are ready to have them processed, you should press what key(s)?

1. Tab only
2. Ctrl and Tab
3. Ctrl and Alt
4. Enter/return

1-39. Function keys F1-F10 are specifically designed for what purpose?

1. To provide standard information to all programs
2. To control cursor placement on the screen
3. To be defined by each program for its own use
4. To allow changing the size of the characters displayed on the screen

1-40. What are the functions of the left and right arrow keys?

1. To move the cursor one position left or right, respectively
2. To move the cursor one line up or down, respectively
3. To insert a character to the left or right of the position of the cursor, respectively
4. To delete the character to the left or right of the cursor, respectively

1-41. Which of the following types of keys are examples of control keys?

1. F1 through F10
2. Print screen, delete, and insert
3. Numbers and special characters
4. Alternate, space bar, and enter/return

1-42. Which of the following types of keys are examples of special function keys?

1. Cursor control
2. Tab and control
3. Letters and numbers
4. Space bar and back space

1-43. Which of the following properties is NOT a characteristic of a disk?

1. Flat
2. Round
3. Direct access
4. Sequential access

1-44. Diskettes are also known by which of the following terms?

1. Floppy disk
2. Read-only disk
3. Write-only disk
4. Hard disk

1-45. Diskettes come in which of the following sizes, in inches?

1. 3 and 5
2. 3 1/4 and 5
3. 3 and 5 1/4
4. 3 1/2 and 5 1/4

1-46. The index hole on a diskette serves which of the following purposes, if any?

1. Marks the first sector of the diskette
2. Indicates the front side of the diskette
3. Indicates the back side of the diskette
4. None

1-47. When software controls sector timing of diskettes, (a) what sector type is being used, and (b) which of the following numbers of timing holes are required on the diskette?

1. (a) Hard-sectored
   (b) One only
2. (a) Hard-sectored
   (b) Several
3. (a) Soft-sectored
   (b) One only
4. (a) Soft-sectored
   (b) Several

1-48. What is the purpose of a formatter program, routine, or command?

1. To sector a soft-sectored diskette
2. To create file labels on a diskette
3. To establish a naming pattern for writing files on a diskette
4. To set up a routine to be used to read a diskette that already contains files

1-49. A diskette that can be written on both sides and can hold 512 bytes of information in each sector is what type of diskette?

1. Dual-sided, single-density
2. Dual-sided, double-density
3. Double-sided, single-density
4. Double-sided, double-density

1-50. You want to prevent data from being written on a diskette. What should you usually do to the write-protect notch if you are using a (a) 5 l/4-inch diskette and a (b) 3 l/2-inch diskette?

1. (a) Cover it
   (b) cover it
2. (a) Cover it
   (b) uncover it
3. (a) Uncover it
   (b) cover it
4. (a) Uncover it
   (b) uncover it

1-51. Rigid metal platters contained in a small sealed unit either within the system unit or external to it are called what type of disk drive?

1. Colt
2. Winchester only
3. Hard disk only
4. Winchester or hard disk

1-52. Speed, large storage capacities, and convenience are all advantages of which of the following storage media?

1. Diskettes
2. Hard disks
3. Paper tape
4. Magnetic tapes

1-53. Printers used with microcomputers usually have which of the following speeds and print characters in what manner?

1. Low speed, one character at a time
2. Low speed, one line at a time
3. High speed, one character at a time
4. High speed, one line at a time

1-54. Which of the following types of nonimpact printers can be used for both printing and plotting?

1. Laser
2. Ink jet
3. Electrostatic
4. Electrosensitive

1-55. Control panels allow you to select various settings on a printer. What is the purpose of a form-feed button?

1. To eject paper from the printer
2. To advance the paper to the top of the next form
3. To allow you to select reprinted forms
4. To advance the paper 1 1/2 inches

1-56. Before a printer can print, the indicator lights must be in which of the following conditions?

1. The power light on, the online light off, and the error light off
2. The power light on, the offline light on, and the error light on
3. The power light on, the online light on, and the error light off
4. The power light on, the offline light on, and the error light off

1-57. To freehand sketch or to select items from menus on a display screen, you use what device?

1. Cat
2. Mouse
3. Modem
4. Optical scanner

1-58. CD-ROM uses a technology called WORM. What does WORM mean?

1. Write or read many
2. Write once, read many
3. Write or read memory
4. Write once, read memory

1-59. A cable that allows devices to communicate without modems and phones lines is called a

1. convert cable
2. phone cable
3. null modem cable
4. connector cable

1-60. To find out how to install or configure a piece of hardware, you should use what reference source?

1. User/owner's manual
2. Diagnostics manual
3. Training manual
4. Textbook

1-61. Which of the following sections is NOT contained in the manuals that come with a system or the software?

1. Reference
2. Error messages
3. Troubleshooting
4. Standard operating procedures

1-62. You should look at the headings in the table of contents and browse the appendices, glossary, and index of a manual for which of the following reasons?

1. To get an idea of what information the manual contains only
2. To see how the information is organized only
3. To get an idea of what information the manual contains and how it is organized
4. To decide whether to buy additional copies

1-63. Online tutorials that come with software packages usually have which of the following purposes?

1. To teach all the commands of the software
2. To give you an overview of what the software can do and how it works
3. To drill you in keying the correct information for specific applications
4. To help you memorize all the functions and special commands

1-64. Keyboard templates and reference cards are useful because they provide which of the following information?

1. Detailed instructions about each feature
2. Identification of features and associated keystrokes
3. Keyboard schematic with a detailed description of each key and all its functions
4. Keyboard schematic with the ASCII coding associated with each key

1-65. In-house user manuals have which of the following functions?

1. To implement command policy only
2. To implement command procedures only
3. To implement command policy and procedures
4. To implement security regulations only

ASSIGNMENT 2

Textbook Assignment: "Computer Hardware Startup (continued)," chapter 1, pages 1-26 through 1-29; "Computer Center Operations," chapter 2, pages 2-1 through 2-35; "Data Management," chapter 3, pages 3-1 through 3-6.

2-1. Which of the following devices,if any, gets its power supply from the system unit rather than through its own power line cable?

1. Printer
2. Keyboard
3. Monitor
4. None

2-2. High voltage can overload and literally burn up the computer's internal components. To avoid high voltage peaks, you should use what device?

1. Mouse
2. Fuse box
3. Surge protector
4. Gender changer

2-3. What device has a cable with a twenty-five pin serial connector to connect it to the system unit?

1. Monitor
2. Keyboard
3. Printer
4. Surge protector

2-4. Which of the following types of devices can usually operate in either a serial or a parallel mode?

1. Keyboards
2. Monitors
3. Printers
4. Surge protectors

2-5. What is the criteria for submitting a trouble report?

1. There is a problem with hardware that you cannot correct
2. There is a problem with software that you cannot correct
3. Both 1 and 2 above
4. The system is completely down

2-6. Computer rooms preset temperatures to prevent equipment failures. Regardless of temperature requirements, which of the following temperature ranges is most often maintained in computer rooms?

1. 60°F - 65°F
2. 65°F - 70°F
3. 70°F - 75°F
4. 75°F - 80°F

2-7. What instrument is used to monitor both temperature and humidity in a computer space?

1. Hygrometer
2. Barometer
3. Thermometer
4. Hypothermagraph

2-8. What type of distinctive function keys, provided by the manufacturer, provide faster and easier performance of routine functions?

1. Special
2. Command
3. Programmable
4. Atypical

2-9. When powering up a computer you should power up the CPU first, then each piece of equipment individually for which of the following reasons?

1. To save time
2. To save power
3. To prevent a surge of power
4. To verify all the indicator lights are working

2-10. As a computer console operator, you normally have to reboot (IPL) the computer system after each of the following conditions except which one?

1. The system has lost power
2. The system has gone into a wait state
3. The system is shut down for repairs
4. The system is disabled due to a system crash

2-11. Some mainframe computers use a disk to store their operating system. This disk is known by which of the following names?

1. DISKMAIN
2. MAINSYS
3. PACSYS
4. SYSRES

2-12. What are the two types of computer diagnostics?

1. Internal and external
2. Internal and booted
3. External and peripheral
4. External and selected

2-13. As a computer console operator, you are responsible for responding to messages from the computer. Basically, you are concerned with what two types of messages?

1. Program and control
2. User and applications
3. System and conditional
4. Operating system and program generated

2-14. As a computer console operator, you can determine if a job is active, stopped, terminated, or waiting for printer by performing which of the following console functions?

1. Initiating job log
2. Displaying job status
3. Querying job queue
4. Displaying master scheduler

2-15. Normally, the programmer determines the points in a program where a job can be restarted without having to rerun the entire job. Thes points are known by what term?

1. Program checks
2. Checkpoints
3. Branchpoints
4. Cutoff points

2-16. When a program is cancelled or terminates abnormally, i is said to have

1. ABENDED
2. ABANDONED
3. ERROR STOPPED
4. JOB HALTED/STOPPED

2-17. When a program abnormally terminates, you will normally be required to dump the contents of storage for which of the following reasons?

1. To save space on the storage media
2. To allow for reconstruction of the input data
3. To help the programmer analyze the program
4. To clear out the problem area that caused the abnormal termination

2-18. What is/are the main reason(s) for relieving a shift 15 to 30 minutes early?

1. Get acquainted with the jobs running
2. Provide constancy between shifts
3. Provide continuity between operators
4. All of the above

2-19. If a job terminates before going to a normal EOJ, you, as the I/O control clerk, may be required to collect which of the following data/information?

1. Output data and memory dump only
2. Input data and SCL statements only
3. Input data, output data, and memory dump
4. Output data, console printout, and SCL statements

2-20. What makes up a basic virus?

1. A malicious program segment that leaves no obvious signs of its presence
2. Complex instructions that have been designed to stop your computer system from booting up
3. A malicious program segment that creates obvious signs of its presence
4. Complex instructions that cause the peripheral devices to log on and off by themselves

2-21. Magnetic tape must be acclimated to the atmosphere in which it will be used for what minimum period of time?

1. 6 hours
2. 12 hours
3. 18 hours
4. 24 hours

2-22. A media librarian is NOT expected to perform which of the following tasks?

1. Maintain off-site storage tapes and disks for disaster recovery
2. Maintain control of data files, program files, and various types of microforms
3. File all library materials in a neat, organized, and uniform manner
4. Make necessary SCL program changes prior to releasing jobs from the library

2-23. What is the total number of 90-day extensions that may be granted before the tape is copied to another tape?

1. One
2. Two
3. Three
4. Four

2-24. What person is responsible for updating fire-fighting instructions and ensuring fire-fighting equipment is maintained in the magnetic media library?

1. Media librarian
2. Local fire marshal
3. Damage control petty officer
4. Computer operations supervisor

2-25. As media librarian, you have just removed a new tape from the shipping container. Which of the following factors or actions ensures that nothing is internally wrong with the tape?

1. The protective covering is still on the tape
2. The warranty of the manufacturer is in effect
3. Verification of the tape with a tape cleaner/certifier
4. Visual inspection of the shipping container, looking for physical damage

2-26. What are the two types of labels used for magnetic media?

1. Internal and EOF
2. Internal and external
3. External and media
4. External and BOF

2-27. As media librarian, you are NOT responsible for the initial preparation of which of the following tape labels?

1. Save
2. Usage
3. Certification
4. Identification

2-28. Which of the following labels remains on a magnetic tape throughout its life cycle?

1. Save
2. Usage
3. Program
4. Identification

2-29. On magnetic tape, what is the purpose of the usage label?

1. It indicates how often a tape is to be certified
2. It helps to identify what has been previously written on the media
3. It contains information that helps to identify the job or task number
4. It indicates the number of times a tape has been read from or written to

2-30. When using internal labeling, how many blocks of information, if any, are written immediately after the BOT marker?

1. Five
2. Two
3. Six
4. None

2-31. Which of the following is a good tape handling practice?

1. Store magnetic tape in a horizontal position
2. Stack tapes with wrap-around straps in stacks of 20
3. Carry magnetic tape by the center hub, never the flanges
4. Using both hands, mount tape by applying an even amount of pressure to the outer flange

2-32. Whenever you are retrieving, storing, or handling a disk pack, you should always carry it in which of the following ways?

1. By the handle located on the top cover
2. By the handle located on the bottom cover
3. By placing both hands on the bottom cover
4. Under your arm, so it will not get away from you

2-33. When you are working with magnetic tape, the greatest number of tape errors are normally found in what area of the tape?

1. Within the feet
2. Within the
3. In the middle of the tape
4. On the edges of the tape

2-34. A new tape should be cleaned (a) a minimum of how many times, and (b) for what reason?

1. (a) One
   (b) to relieve tape packing
2. (a) One
   (b) to help prevent head wear
3. (a) Two
   (b) to relieve tape packing
4. (a) Two
   (b) to help prevent head wear

2-35. When you are cleaning a tape, (a) what is used to remove protrusions from the oxide surface, and (b) what is the maximum percentage of tape errors that are removed?

1. (a) Knives
   (b) 75%
2. (a) Wiping assemblies
   (b) 75%
3. (a) Knives
   (b) 90%
4. (a) Wiping assemblies
   (b) 90%

2-36. Soft data checks are also called what type of errors?

1. Permanent
2. Temporary
3. Hard parity
4. Head-to-disk contact

2-37. What action does the degaussing of magnetic media accomplish?

1. Sorts out individual bits
2. Rearranges all alphabetic and numeric characters
3. Magnetically saturates the oxide coating and rearranges all 0 and 1 bits
4. Demagnetizes the media and then replaces EOT and BOT markers with up-to-date labels for reuse

2-38. What guidelines, if any, do you use to destroy magnetic tape and diskettes?

1. Local SOPS
2. OPNAVINST 5530.14
3. SECNAVINST 5233.1
4. None

2-39. Most AIS installations have incorporated or are capable of installing an automated tape library control (ATLC) system. Which of the following processes takes place in an ATLC system?

1. Save labels are automatically scanned by an optical reader
2. Storage, handling, and retrieval of magnetic media are done automatically
3. Tape/disk files are automatically saved, retained, and scratched, based on purge dates
4. Information needed to build an ATLC master record is automatically extracted from the media's internal label

2-40. Under an ATLC system, what report indicates the tapes that are to be scratched or released?

1. The library maintenance report
2. The media to be released report
3. The user/programmer report
4. The applications report

2-41. The diskette should be inserted in a horizontal diskette drive with (a) the label and (b) the recording window facing in which of the following directions?

1. (a) Up
   (b) toward the drive door
2. (a) Up
   (b) away from the drive door
3. (a) Down
   (b) toward the drive door
4. (a) Down
   (b) away from the drive door

2-42. What is the extension of a file named DIAG-A.89?

1. DIAG
2. A.89
3. 89
4. A

2-43. When you display a tree-structured directory on a monitor screen, what notation identifies subdirectories?

1. <DIR>
2. <B/S>
3. <BDIR/S>
4. SUB as an extension

2-44. What command is used to instruct DOS to create a directory?

1. CD
2. CHDIR
3. DIR
4. MKDIR

2-45. To move through a tree-structured directory, you must issue commands that use what name?

1. Branch name
2. Trunk name
3. Path name
4. Leaf name

2-46. You run the risk of losing data and programs stored on disk if you do not take which of the following actions?

1. Make backup copies
2. Enter security codes in the file name
3. Assign a volume number and name to each disk
4. Use subdirectories to store similar data and programs

2-47. Which of the following actions, if any, can you take to help prevent data loss and extend the life of floppy disk drives?

1. Perform diagnostic routines periodically to see if there are any problems
2. Clean floppy disk drives with a head cleaning diskette
3. Clean the floppy disk drives with a cleaning solution on a soft cloth
4. None

2-48. When you load or unload a tape from a tape drive, which of the following conditions should you look for?

1. Reel warpage
2. Tape protruding
3. Irregular winding
4. All of the above

2-49. Assume you have mounted a tape on tape unit 2 and notice that during the loading phase the tape is wobbling. Which of the following conditions could cause this problem?

1. The tape tension is uneven
2. The drive capstans are not properly aligned
3. The file protect ring is not completely inserted
4. The volume of air in the vacuum columns is low

2-50. When you adjust the tractors on a printer, it is good practice to keep which of the following tractors in one permanent location?

1. Upper tractors
2. Lower tractors
3. Left-hand tractors
4. Right-hand tractors

2-51. On a printer, the paper thickness control knob has a direct effect on which of the following printer functions?

1. Forms stacking
2. Quality of print
3. Alignment of preprinted forms
4. Line-by-line movement of paper

2-52. Your system will probably provide a read disk test, a keyboard test, and a power-up test. These types tests are characterized by what term?

1. Offline routines
2. Diagnostic routines
3. Operator maintenance
4. Corrective maintenance

2-53. Software that is specifically designed to coordinate the capabilities of the computer itself is called what type of software?

1. Systems
2. Computer
3. Scheduling
4. Operations

2-54. Programs that are designed to solve individual user problems are called what type of programs?

1. CDA
2. General
3. Privileged
4. Applications

2-55. When you write a program, which of the programming language categories listed below would be the most time consuming?

1. COBOL
2. FORTRAN
3. Machine
4. Assembly

2-56. There are a whole host of high-level programming languages. Which of the following languages was designed with the professional programmer in mind?

1. Ada®
2. C++
3. COBOL
4. FORTRAN

NOTE : Ada is a registered trademark of the U.S. Department of Defense.

2-57. All microcomputer systems will have at least what type of software?

1. A window program
2. An operating system
3. A word processing package
4. A data base management system

2-58. Which of the following types of information must you provide to an applications software package when you install it on a microcomputer system?

1. Microcomputer configuration information
2. Examples of the work that will be performed
3. Lists of outputs you want on a scheduled basis
4. All of the above

2-59. To make a microcomputer system easier for the user to start each day, you should take what action?

1. Give the user a written list of specific instructions to follow
2. Set the system to automatically boot when the user turns on the power
3. Go to each system each morning and boot the system for the user
4. Make arrangements for one person in each functional area to boot all the systems each day

2-60. Before turning the power off on a microcomputer system, the user should take which of the following actions?

1. Save his/her work
2. Exit the program to return to the operating system
3. Park the read/write heads if using a hard drive
4. Deenergize the system

2-61. Packaged software does NOT include which of the following software?

1. Database
2. Word processing
3. Job control
4. Spreadsheet

2-62. Regardless of the software package you are using, it is NOT mandatory that you be capable of executing which of the following operations?

1. Access and execute the software
2. Save files
3. Delete files
4. Run diagnostics

2-63. To perform file management functions effectively, you must know which of the following facts about files?

1. How they are set up and coded
2. How they are named
3. How they are backed up
4. All of the above

2-64. When you are learning how to use a software package, you should NOT take which of the following actions?

1. Take the tutorial/study the learning section
2. Create a test file and practice on it
3. Practice on the master data file
4. Make mistakes on purpose to see how the software handles operator/user errors

2-65. Commands composed of words and/or characters predefined by the software to perform specific tasks are what type of commands?

1. Direct
2. Indirect
3. Execute
4. Job

2-66. Function keys have which of the following purposes?

1. To perform user defined functions only
2. To perform commonly used commands without the user having to type the command
3. To provide user status information only
4. To enter data and program information

ASSIGNMENT 3

Textbook Assignment: "Data Management (continued)," chapter 3, pages 3-6 through 3-27.

3-1. When you are learning a new software package, what method of interfacing with the software is usually the easiest?

1. Menu
2. Direct commands
3. Function keys
4. Programs/macros

3-2. Use of what feature(s) enables you to enter and save a series of keystrokes for later use?

1. Function keys
2. System commands
3. Job languages
4. Macro capability

3-3. Macros can be developed and stored to perform which of the following types of tasks?

1. Repetitive only
2. Complex only
3. Awkward only
4. Repetitive, complex, and awkward

3-4. What type of software package is designed primarily to work with documents?

1. Word processing
2. Spreadsheet
3. Graphics
4. Database

3-5. What is the usual method of entering a document?

1. Type it on a keyboard
2. Receive it over a network
3. Input it through a scanner
4. Import it from a desktop publishing program

3-6. Once entered, a document is normally stored as a data file in what way, if at all?

1. In RAM
2. In ROM
3. On a secondary storage medium
4. None; documents are only printed, not stored

3-7. You are using a word processing program and want to add new material to a document. What mode of operation should you use?

1. New
2. Add
3. Insert
4. Typeover

3-8. What feature of word processing enables you to continue typing without regard for where a line ends?

1. Word wrap
2. Hyphenation
3. End around
4. Automatic return

3-9. To underline or center material, you should use what feature?

1. Cursor movement key
2. Direct command
3. Function key
4. Macro

3-10. Usually, a dictionary is included with which of the following software?

1. Database
2. Spreadsheet
3. Word processing
4. Desktop publishing

3-11. What type of software package works in columns and rows?

1. Database
2. Spreadsheet
3. Graphics
4. Desktop publishing

	A	B	C	D
1	ITEM	QUANTITY	COST	TOTAL$
2	Tapes	10	27.50	275.00
3	Disks	4	350.00	1400.00

Figure 3A

IN ANSWERING QUESTIONS 3-12 THROUGH 3-16, REFER TO FIGURE 3A.

3-12. What total number of data cells are shown?

1. 7
2. 12
3. 3
4. 4

3-13. What value is shown in data cell B3?

1. 27.50
2. 10
3. 350.00
4. 4

3-14. The values in the total column are calculated by the software by the user specifying a formula to perform what calculation, if any?

1. Column B times column C
2. Column B plus column C
3. Column C squared
4. None

3-15. If you need to change the quantity of tapes and recalculate the cost, which data cells would you have to change from the keyboard?

1. B2 only
2. B2 and C2 only
3. B2 and D2 only
4. B2 , C2, and D2

3-16. In the spreadsheet, (a) what term is used to describe the entries in column A, and (b) what type of data does column A contain?

1. (a) Labels
   (b) numeric
2. (a) Labels
   (b) nonnumeric
3. (a) Values
   (b) numeric
4. (a) Values
   (b) nonnumeric

3-17. Which of the following names is/are also used to describe a spreadsheet?

1. Array only
2. Matrix only
3. Worksheet only
4. Array, matrix, and worksheet

3-18. What type of software packages work primarily with records, fields, indexes, pointers, and keys?

1. Graphics
2. Database
3. Spreadsheet
4. Word processing

3-19. To access records in a database in a sequence other than the sequence in which they are stored, you can use which of the following techniques?

1. Indexes
2. Pointers
3. Directories
4. Key searches

3-20. List databases use what technique to link records?

1. Indexes
2. Pointers
3. Catalogs
4. Directories

3-21. What type(s) of database structure link(s) related data elements by using superior-subordinate relationships?

1. Network only
2. Hierarchical only
3. Hierarchical and network
4. Relational

3-22. What type of database structure enables the user to establish relationships when requesting information rather than requiring relationships be established at the time the structure is defined?

1. List
2. Network
3. Relational
4. Hierarchical

3-23. With database software, what name is given to the type of language used to retrieve information from a database?

1. Query
2. System
3. Information
4. Report generator

3-24. When you want to produce a high quality printed document with a variety of type sizes and styles, what type of software package would be best to use?

1. Word processing
2. Desktop publishing
3. Graphics
4. Database

3-25. When you want to use desktop publishing software to process a document you created with word processing software, you will have to take what action?

1. Import the document file
2. Rekeystroke the document
3. Reformat the document file using a stand-alone utility program
4. Translate the document file using a stand-alone utility program

3-26. Which of the following is NOT a function of desktop publishing software?

1. Composition
2. Calculations
3. Graphics
4. Layout

3-27. Layout involves which of the following tasks?

1. Arranging text only
2. Drawing borders only
3. Incorporating illustrations only
4. Arranging text, drawing borders, and incorporating illustrations

3-28. The space added between lines of material is known by what term?

1. Letter spacing
2. Gutter spacing
3. Clipping
4. Leading

3-29. You can expect to find which of the following capabilities relating to graphics in a desktop publishing program?

1. Resizing only
2. Importing only
3. Color layering only
4. Resizing, importing, and color layering

3-30. At a minimum, to effectively use desktop publishing software requires which of the following processors?

1. A 286 16-bit
2. A 386 16-bit
3. A 486 16-bit
4. A Pentium 32-bit

3-31. The monitor to use with desktop publishing software should have (a) what resolution and (b) at least what size screen?

1. (a) High (b) 13-inch
2. (a) High (b) 19-inch
3. (a) Low (b) 13-inch
4. (a) Low (b) 19-inch

3-32. What type of printer is best to use with desktop publishing?

1. Daisy wheel
2. Dot-matrix
3. Laser
4. Band

3-33. Software utilities can NOT

1. enhance your computer's capabilities
2. fill some of the voids left by operating systems and applications software
3. replace the need for application software to perform tasks like word processing and database
4. make your computer more efficient

3-34. Software utilities can be categorized into which of the following groups?

1. File maintenance and file management only
2. Keyboard enhancers, DOS shell, and backup utilities only
3. Desktop organizers, printer utilities, and virus utilities only
4. File management, file maintenance, keyboard enhancers, DOS shell, backup utilities, desktop organizers, printer utilities, and virus utilities

3-35. What type of utility usually includes a calculator, notepad, phone directory, and appointment book?

1. File management
2. File maintenance
3. Desktop organizer
4. Printer

3-36. File compression routines are often a feature of backup utilities. They have which of the following advantages?

1. Make data easier to read
2. Allow more data to be placed on a diskette
3. Require fewer data files for data storage
4. Each of the above

3-37. File management utilities perform which of the following functions?

1. Manipulate files only
2. Manipulate directories only
3. Manipulate files and directories
4. Provide file recovery

3-38. File maintenance utilities are NOT designed to perform which of the following tasks?

1. Encrypt data
2. Repair low-level format damage on hard disks
3. Control access to resources and files
4. Organize files and set file attributes

3-39. What person is the primary source in determining the input data and output material?

1. User
2. Programmer
3. I/O control clerk
4. Technical administrator

3-40. How a file will be accessed by the program is determined at which of the following times?

1. When the DBMS is selected
2. During the creation of the schema
3. During the creation of the subschema
4. When the file is downloaded

3-41. Which of the following is the most commonly used file organization method?

1. Sequential
2. Indexed sequential
3. Direct

3-42. Of the following features of a DBMS, which one, if any, is more important than the others?

1. Easy access to the data
2. Storage and maintenance of large volumes of data
3. Capability for sharing the data resources
4. None; all are equally important

3-43. In a DBMS environment, users do not want to share their data with other users of the database.

1. True
2. False

3-44. Technical and nontechnical DBMS users need different views of data.

1. True
2. False

3-45. A conventional computer system has few application programs or systems using different databases and files.

1. True
2. False

3-46. Which of the following defines a DBMS schema?

1. The actual data in the database framework
2. The software description of the operating system
3. An overall logical database description or framework
4. A data aggregate of owner-type records

3-47. Which of the following items enhances security factors and helps prohibit data compromise?

1. A schema
2. A subschema
3. A subroutine
4. A data converter

3-48. All data provided by the DBMS in response to a CALL for data is delivered to what is conceptually a loading and unloading zone called a

1. system buffer
2. I/O control area
3. user working area
4. DBMS waiting buffer

3-49. A data item can be described as an occurrence of which of the following elements?

1. A bit in a database
2. The largest unit of named data
3. The smallest unit of named data
4. A byte in a database

3-50. A data aggregate is an occurrence of a named collection of data items within a

1. byte
2. file
3. record
4. system

3-51. A vector is which of the following (a) sequences of data items that have which of the following (b) characteristics?

1. (a) One-dimensional (b) different
2. (a) One-dimensional (b) identical
3. (a) Two-dimensional (b) different
4. (a) Two-dimensional (b) identical

3-52. Which of the following is a unique value that identifies a record in the database to a run unit?

1. A sort key
2. A search key
3. An actual key
4. A database key

3-53. An occurrence of a named collection of records is called a

1. key
2. set
3. mark
4. keyword

3-54. Each set occurrence must contain what minimum number of occurrences if it is defined as an owner type of record?

1. One
2. Two
3. Three
4. Four

3-55. A named collection of records that need not preserve owner/member relationships is called a/an

1. set
2. area
3. data item
4. database key

3-56. A database consists of all of the following items controlled by a specific schema except which one?

1. Sets
2. Areas
3. Files
4. Records

3-57. The data manipulation language relies on which of the following language types to provide the procedural capabilities required to manipulate data?

1. Host
2. Query
3. Application
4. DDL

3-58. After the database physical description has been examined, which of the following items keys the actual physical record to be read?

1. DDL
2. DBMS
3. The object program
4. The console operator

3-59. When data has been requested by a DBMS, to which of the following areas does the operating system deliver the requested data from the database?

1. User work area (UWA)
2. System buffers
3. DBMS
4. DMS

3-60. After the operating system has transferred data to the system buffer area, where does the DBMS deliver the data to be used by a source program?

1. To a system work disk
2. To a system work tape
3. To the user work area (UWA)
4. To system buffer areas 1 and 2

3-61. A schema data definition language (DDL) entry includes references to a physical device or media space.

1. True
2. False

3-62. Which of the following items is/are contained in a DDL?

1. Literal formatting only
2. Key words only
3. Reserved words only
4. Literal formatting, key words, and reserved words

3-63. To specify the relationship between DDL declarations and DML commands, a set of basic data manipulation functions must be defined that is independent of which of the following languages?

1. DML only
2. Host language only
3. DML and the host language
4. DDL

3-64. When selecting a DBMS, the primary consideration should be to select a technology that will meet which of the following criteria?

1. Be the lowest cost
2. Be the easiest to use
3. Require the shortest implementation time
4. Support the long-term DBMS needs

3-65. When a DBMS is selected for a microcomputer system, which of the following is/are (an) important additional concern(s)?

1. Capability of receiving downloaded data
2. Ability to be used on a network
3. Ability to enable quick and easy screen formats
4. All of the above

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NOTE: IF YOU HAVE NO COMMENTS, YOU DO NOT HAVE TO SUBMIT THIS FORM.

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TITLE_____ NAVEDTRA_____

NAME_____ ADDRESS_____
Last First Middle Street/Ship/Unit/Division, etc.

_____
City or FPO State Zip

RANK/RATE_____ SSN_____ DESIGNATOR_____ ASSIGNMENT NO._____ DATE SUBMITTED _____

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify)_____

SCORE

	1 T	2 F	3	4			1 T	2 F	3	4			1 T	2 F	3	4	
1	☐	☐	☐	☐	_____	26	☐	☐	☐	☐	_____	51	☐	☐	☐	☐	_____
2	☐	☐	☐	☐	_____	27	☐	☐	☐	☐	_____	52	☐	☐	☐	☐	_____
3	☐	☐	☐	☐	_____	28	☐	☐	☐	☐	_____	53	☐	☐	☐	☐	_____
4	☐	☐	☐	☐	_____	29	☐	☐	☐	☐	_____	54	☐	☐	☐	☐	_____
5	☐	☐	☐	☐	_____	30	☐	☐	☐	☐	_____	55	☐	☐	☐	☐	_____
6	☐	☐	☐	☐	_____	31	☐	☐	☐	☐	_____	56	☐	☐	☐	☐	_____
7	☐	☐	☐	☐	_____	32	☐	☐	☐	☐	_____	57	☐	☐	☐	☐	_____
8	☐	☐	☐	☐	_____	33	☐	☐	☐	☐	_____	58	☐	☐	☐	☐	_____
9	☐	☐	☐	☐	_____	34	☐	☐	☐	☐	_____	59	☐	☐	☐	☐	_____
10	☐	☐	☐	☐	_____	35	☐	☐	☐	☐	_____	60	☐	☐	☐	☐	_____
11	☐	☐	☐	☐	_____	36	☐	☐	☐	☐	_____	61	☐	☐	☐	☐	_____
12	☐	☐	☐	☐	_____	37	☐	☐	☐	☐	_____	62	☐	☐	☐	☐	_____
13	☐	☐	☐	☐	_____	38	☐	☐	☐	☐	_____	63	☐	☐	☐	☐	_____
14	☐	☐	☐	☐	_____	39	☐	☐	☐	☐	_____	64	☐	☐	☐	☐	_____
15	☐	☐	☐	☐	_____	40	☐	☐	☐	☐	_____	65	☐	☐	☐	☐	_____
16	☐	☐	☐	☐	_____	41	☐	☐	☐	☐	_____	66	☐	☐	☐	☐	_____
17	☐	☐	☐	☐	_____	42	☐	☐	☐	☐	_____	67	☐	☐	☐	☐	_____
18	☐	☐	☐	☐	_____	43	☐	☐	☐	☐	_____	68	☐	☐	☐	☐	_____
19	☐	☐	☐	☐	_____	44	☐	☐	☐	☐	_____	69	☐	☐	☐	☐	_____
20	☐	☐	☐	☐	_____	45	☐	☐	☐	☐	_____	70	☐	☐	☐	☐	_____
21	☐	☐	☐	☐	_____	46	☐	☐	☐	☐	_____	71	☐	☐	☐	☐	_____
22	☐	☐	☐	☐	_____	47	☐	☐	☐	☐	_____	72	☐	☐	☐	☐	_____
23	☐	☐	☐	☐	_____	48	☐	☐	☐	☐	_____	73	☐	☐	☐	☐	_____
24	☐	☐	☐	☐	_____	49	☐	☐	☐	☐	_____	74	☐	☐	☐	☐	_____
25	☐	☐	☐	☐	_____	50	☐	☐	☐	☐	_____	75	☐	☐	☐	☐	_____

THIS FORM MAY BE LOCALLY REPRODUCED